EPITOME OF EVIDENCE

TAKEN BEFORE

THE COMMISSIONERS

APPOINTED TO INQUIRE INTO THE

CONDITION OF ALL MINES IN GREAT BRITAIN

TO WHICH THE PROVISIONS OF THE ACT 23 & 24 VICT. CAP. 115.
DO NOT APPLY,

WITH REFERENCE TO THE

HEALTH AND SAFETY OF PERSONS EMPLOYED IN SUCH MINES.

Presented to both Houses of Parliament by Command of Her Majesty.

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EPITOME OF EVIDENCE.

CORNWALL AND DEVON.

(A.)—HEALTH AND DISEASES OF MINERS.

Health *Diseases* *Miners.*

Mr. James Barkell.

951. (*Mr. Austin Bruce.*) Have you ever heard from them any complaint as to their health being affected by the nature of their work?—No.

952. Are no coughs attributed to it?—Not that I know of.

953. Have you a doctor connected with your mine?—We have a doctor at the mine, and our men pay to the doctor.

Mr. James Seccombe.

1419. (*Chairman.*) Have you known of other cases in which men have suffered in their health materially from the same cause?—I think that there has been a great improvement in latter years to what there was when I began at first. We did not think then of carrying down a mouthful of anything to eat with us, even if we stopped down for ten or 12 hours, nor to drink; and sometimes when there were two in a pair or four in a pair, they stayed down longer, but now we find that almost all the men carry down with them a little water to drink, and a bit of something to eat.

1420. What do they carry the water down in?—Sometimes they have a little keg tied round their waist, and sometimes they carry a bottle.

1421. I suppose that in a hot end the water becomes very warm?—Yes; and the men perspire a good deal in working, but I think the water is a benefit to them, and that they are better calculated than what they used to be to take care of themselves.

1424. Do you think the men do suffer who have been working underground?—Yes, if they work in close places, which are not well ventilated, they must.

1452. (*Mr. Kendall.*) You have been talking about being asthmatical; do you think that was caused by working in your early days underground?—I can hardly say that. I recollect that Mr. Pierce, the surgeon, used to attend us when I was about 17 or 18 years of age, and he told me not to work in the place that I did, on account of the bad air; but I always had a cough as a young man.

1539. (*Mr. Austin Bruce.*) You have stated that the men take more care of themselves than they did formerly?—I think they do. They now have something to drink and to eat during their work, and that I think, myself, is a good plan. My experience shows me that that is better for the men than to go for eight or nine or ten hours without anything.

Mr. William Rich.

1597. (*Chairman.*) Are they all healthy?—They are very well, I think.

1598. What is your opinion as to the cause of the ill-health of the miners?—It is bad ventilation, generally, and the dust from the ore, and the powder-smoke, and various causes.

1599. Dust does come from the ore?—Certainly.

1600. And I suppose if there is mundic in it, it is much worse?—Yes; mundicky and copper are very bad.

1601. How does it affect the men?—It produces a tightness in the chest and a difficulty in breathing; it loads up the lungs.

1602. Does it affect the general health of the miners, or what is the first symptom of illness in the miners?—Paleness in the face, shortness in the breath, and weakness in the legs, and a difficulty in climbing.

1603. Do you think that the climbing up the ladder has nothing to do with it?—It is a very trying thing, the climbing up deep mines; but the men need not climb so hard as they do; they can make it hard or easy, as they please.

Mr. Richard Pascoe.

1769. (*Chairman.*) At what age did they die?—At about 30 or 40; they have killed themselves in that time. My father died at 44, and I believe all through breathing poor air.

(A.) *Health and Diseases of Miners.*

1797. (*Mr. Holland.*) They never recover completely, do they?—No, they might have worked a little, but they never get well enough to be sound men.

A Miner.

1867. (*Chairman.*) Have they suffered?—Yes, they suffer more or less. There are not many miners, at the age of 45 or 50, but who suffer either more or less from what they term the miners' complaint, that is, a tightness and shortness of breath.

Mr. Peter Clymo.

2362. (*Mr. Fulke Egerton.*) Do you think fewer suffer now than have suffered in the past few years?—I think the number is smaller.

Mr. William Cock.

2603. (*Mr. Austin Bruce.*) Have you ever heard of the disease called the miners' disease?—Yes, I have heard of it.

2604. Did you ever see anybody suffering from it?—I have seen men with a disease upon them, in a consumption, I suppose, as it is commonly called the miner's disease.

2605. How do they show it?—By a shortness of breath generally.

2606. Where did you see those cases?—They are to be seen in most mining districts.

A Miner, No. 1.

2813. (*Mr. Austin Bruce.*) Do you think that your health has suffered from the bad air in which you worked when a younger man?—Yes, I am quite certain of it.

2814. How do you know it?—When I worked in Par Consols the doctor told me that if I did not go away from where I was working, I should go into a consumption in less than six months.

2815. Did somebody take your place when you went away?—Yes.

2816. You are a strong-made man?—Yes.

2817. Was your health as good as that of most men?—Yes, generally.

2818. Do you know what became of the men who followed you in that place?—No.

A Miner (No. 2.)

2884. (*Mr. Austin Bruce.*) Have you ever suffered in health?—No, not very much; I do not know that I have.

2885. (*Chairman.*) Do you know of miners who have suffered in health?—Yes, I believe that I have known several who have shortened their days by working in close places. We calculate so. My father was a miner, and he died at the age of 55; he considered that he died by what we call the miners' complaint, by working in close places.

2886. (*Mr. Austin Bruce.*) Had he been suffering long before he died?—Yes, he was obliged to stay at home from labour, I think, 16 or 17 months. There are several in the village now who are suffering from some complaint, and it is calculated that it is on account of working in poor air, and so on, in powder smoke, and so on.

2887. (*Chairman.*) Could we see those who are now suffering?—I cannot tell that. I cannot say that I know any person who is laid up at present.

(A.)—HEALTH AND DISEASES OF MINERS.

(A.) Health and Diseases of Miners.

A Miner, No. 3.

2934. (*Chairman.*) Do you know any miners who have suffered from working in poor air?—I do not know that I do about here now; there are several miners here who are bad, but whether it is owing to the poor air or not I do not know.

2935. What is the matter with them?—I am sure I do not know; it is what they call about here the miners' complaint, I believe, that is to say, in the lungs and the liver, and one thing and another. I do not know exactly what it is.

Mr. Christopher Childs.

3145 (*Chairman.*) With regard to a former question as to the health of the miners, is there any other point upon which you wish to give your opinion to the Commissioners?—No: I believe that the whole matter may be summed up in a very few words—better ventilation, and better provision for the miner when coming to grass and changing his clothes.

Mr. Andrew Kingston.

3275. (*Chairman.*) Will you state to the Commissioners what your observations are with regard to the diseases of miners?—The bulk of them are affections of the chest.

3276. How, in your opinion, are those diseases caused?—I think by three things, poor air, occasionally working out of light (they are a long while out of light), and climbing

3289. Would they terminate in consumption if the men did not go back to the mine?—I have found a great difficulty. I believe that many of them would not. I think that if they did not return to the mine they would live on for many years. I recommend some men not to go underground, and they immediately turn round and say, "What shall we do, Sir?" I say, "Do anything; work with a farmer." They say, "The wages are not enough." Then they apply to the mines, and there is not surface work on the mines for them to do. They have a great dislike to agricultural work after they have worked at a mine.

3290. And therefore they return to the mine?—Yes; and after a little while the difficulty is added to until they get thoroughly incapacitated.

3291. And it generally ends in consumption?—Yes.

3292. (*Mr. Holland.*) What they call consumption?—Yes.

3312. (*Chairman.*) In your opinion, are miners more subject to disease than the agricultural population?—Yes: much more so.

3313. To the extent of shortening life?—Yes.

3348. (*Mr. Austin Bruce.*) Do you despair of seeing the general health of the miners improved in this district?—I do not see how the health is to be improved, unless the climbing be lessened and the ventilation improved.

Mr. Robert Dunstan.

3445. (*Mr. Austin Bruce.*) Have you observed any improvement since that time in the health of the miners?—Not much improvement as respects the health of the miners.

3446. What should you say was at this moment the condition of the health of the miners, as compared with the health of the surrounding population?—A miner cannot enjoy his health like other people.

3447. For what reason?—From the nature of the employment.

3448. What is there in the nature of their employment that makes the difference?—Climbing particularly.

3449. Is there anything else?—Yes; the foul air that they breathe, and that they are obliged to work in.

3450. In your opinion, can the climbing be got rid of?—It is got rid of in some instances.

3451. Could it, do you think, be got rid of in more instances?—Yes.

3452. To what extent do you think it could be got rid of?—We consider that in an established mine, the man-engine should be employed for lifting the miners up.

3453. Have you ever thought of any other plan than that of the man-engine, and which would be more convenient?—Yes; but I do not think that any other plan would be applicable in Cornwall.

3454. Do you think that a man-engine would be too expensive for small mines?—I think not, I think that a man engine could be employed very inexpensively.

(A.) Health and Diseases of Miners.

3455. What do you mean by the terms "an established mine"?—I mean where a mine has been discovered to contain minerals of sufficient quantity to admit of its being worked to any extent. There are many mines that are very ephemeral.

3456. In all such cases, you think that a man-engine might be employed?—I think it should be employed.

3457. In your opinion, that would get rid of a great deal of the sufferings of the miners?—Yes; the climbing is the great bane of the miner.

3524. (*Chairman.*) In your experience, as a captain, do you think that the health of those who are working in the mines is worse than the health of those who work above ground?—Yes, certainly; always.

3525. By what, in your opinion, is that caused?—It is caused by three things. Principally it is caused by climbing the ladders; a deep mine is very injurious for that; and it is caused by breathing impure air; and it is caused also by taking frequent chills and colds. When a miner gets to work his work is very laborious, and he gets very hot, and he then, of course, cannot continue at it; he gets into a very high state of perspiration, and goes back to rest himself, and then there is a cold chilliness in all that is about him, and he takes cold. Miners are seldom free from colds, and that brings on an affection of the chest; and there is a complaint which is peculiarly known as the miner's consumption; it brings on an asthmatical complaint, and an affection of the heart, and two or three things altogether, which seem to cause a peculiar miners' complaint.

Mr. William Wale Tayler.

3732. (*Chairman.*) Will you state to the Commissioners how you judge that the effect of this climbing is on the heart; does it produce disease of the heart?—It gradually produces it. Of course, if you tax any muscle beyond its proper strength it must produce disease, and the muscles of the heart being exercised beyond their proper power, become diseased.

3733. How does that extend to the lungs?—Sometimes it does not extend to the lungs; sometimes it causes disease of the lungs separately.

3734. Sometimes they are suffering merely from heart disease?—Yes; and we have had a great deal of it; but since the introduction of the man-engine it is greatly on the decrease.

3740. You say that, compared with the amount of suffering experienced by the miners some time ago, there has been a considerable alteration for the better?—Considerable. I recollect that there used to be from 15 to 20 persons receiving permanent pay from the mine on account of heart disease and consumption, and now I do not think that there are above five or six, if so many, in consequence of the substitution of the man-engine.

3741. Then you attribute that change entirely to the substitution of the man-engine for the ladder?—Yes, entirely. I ascribe that diminution of heart and lung disease to that cause.

3760. Then the state of his dwelling would not make any difference in that respect?—Supposing a man is in the early stage of consumption, it would be very desirable that he should be in a well-aired room; instead of that the probability is that it is quite otherwise, they always stuff up the chimneys, and perhaps several persons are sleeping in the room.

3761. Then in the case of a person in the incipient stage of consumption it would aggravate his disease?—Yes; in fact in the incipient stage of consumption everything is against the miner; very frequently he cannot obtain proper food. The parishes are very willing to listen to any recommendation, but they have so many claims upon them that if a miner has not been economical and he has to come to the parish, of course he must fare badly.

3762. Have you ever recommended miners who were your patients to get better food?—Yes.

3763. Supposing a miner not to be able to provide for himself, would it be your duty, to give notice of that to the parish?—I am a parish officer as well, and I have the power of recommending food.

(A.)—HEALTH AND DISEASES OF MINERS.

Health
Diseases
Miners.

3764. Do you find that your recommendations are complied with?—Yes, they are complied with, but still it would be very desirable if any means could be adopted by which a miner in the early stage of consumption could be removed somewhere where he could really have the proper quantity of food; because, supposing that we order three pounds of meat a-week, the probability is that some of that food will go to the support of the family, and that the miner would not reap the entire benefit of it.

3858. (*Mr Austin Bruce.*) Do you consider that a general average of health is consistent with short life?—It would not appear so. Hereditary disease exists to a very great extent in Cornwall, and consequently they die younger; and they are not ill very long. Most cases of consumption which I have are what I term acute, where the patient goes off in a few months.

3949. (*Mr. Kendall.*) You have stated, as I understood you, that the average life of miners is short, and that their average health is good?—Yes; that is a contradiction.

3950. But, as I understand, you state this with the exception that there are many cases of hereditary disease?—Yes.

3951. How do you account for that hereditary disease?—Very frequently it is in this way; that a miner, when in the last stage of consumption, may beget three or four children, and the probability is that the majority of those children (in fact, I think, that by a good deal of research you could prove it) would be consumptive.

3952. In olden time was much less care taken than is taken now, and did men in consequence become consumptive much more frequently than they do now; was there much care as to the dries and the mode of ascent, and so on, in your experience?—I cannot say much one way or the other.

5953. Were there more cases of consumption in olden time than now?—Undoubtedly; I think that the men are more careful of themselves.

3954. And that the mode of ascent is better?—Of course the mode of ascent is better. I lay great stress upon the man-engine; I think that that is the salvation of the men.

3955. As regards the work of a navvy and of a miner, do you think that the agricultural labourer, who is in the open air, could at all compete with the navvy in work?—I do not know; I am not capable of giving an opinion upon that point. I know from conversing with miners, that they were astonished at the great amount which the navvy did, and that they could not do so much work in the same amount of time.

3989. Surely not to a great extent?—Yes; I suppose that there are few counties where there is more consumption than in Cornwall.

Mr. John Pearce.

4001. (*Chairman.*) What is the next point as to which you differ from Dr. Tayler?—Dr. Tayler was asked whether he had heard the miners complain of any symptoms that were produced by working in bad air. I believe that our mines are, generally speaking, as well ventilated now as they can be, perhaps some more precautions might be taken; but it often happens that where the air is bad, it is in an end where the men are driving to come to a shaft coming down to give them air, or they are putting up a rise, and very often I have heard the men say that their heads have become light and giddy, and that they have had a ringing in the ears which is produced by a bad supply of oxygenated blood to the head. Then again with regard to diseases of the heart, as far as my experience has gone, I have observed a great deal of enlargement of the heart, and that enlargement would necessarily be permanent, and there is hypertrophy of the heart induced by the extra action which the heart is called upon to perform when the men have been climbing from great depths, an increased pulsation of the heart is then caused and increased respiration, and hypertrophy, which is a thickening of the heart. Sometimes there is more functional derangement from which the miners may recover, as is the case with others. Another thing that has struck me forcibly is that miners have not suffered, if at all, more than an equal number of the population in any other class, from phthisis or tubercular consumption, of which there may be perhaps a slight average against the miners; but, as a general rule, I should say it was not so. The disease of the miners which is called consumption, in my opinion, is decidedly nothing more than bronchitis, having the general symptoms of tubercular disease, but those symptoms being very different in their stethoscopic character.

(A.) *Health and Diseases of Miners.*

4051. (*Chairman.*) But many of the men may work on for some time without complaining?—Yes, for many years. There was one poor fellow who has just died, and I knew him to have symptoms of the disease from which he died 15 years ago.

4052. Was he then told that there was a chance of its terminating in the way it did?—I had often said to him, "I will give you something to relieve you, but yours is the miners' disease, and we cannot alter that state of the chest."

4053. What was his reason for going on working after that?—I suppose it would have been difficult for him to get anything else to do.

4054. He was compelled to work on for his livelihood?—Yes.

4135. (*Mr. Austin Bruce.*) To the best of your belief, are there any men under your charge at this moment in whom the miners' disease is forming?—I have no doubt there are; but in answering the question offhand I cannot at once recall cases to my mind. I have two men who are now home suffering from it, but they are advanced cases. I have no doubt that I could find many incipient cases of the miners' disease.

Mr. John Berryman.

4228. (*Chairman.*) You say in an advanced stage of the disease, what is the disease?—I entirely agree with what Mr. Pearce has stated, that there is quite a distinction between tubercular phthisis and the miners' disease, and that they are two distinct disorders. I believe that the foundation of the miners' disease is at first bronchitis, and that repeated attacks of that bronchitis lead to a disordered state of the different tissues of the lungs, the bronchial tubes, and the air vesicles themselves. It is from repeated attacks of bronchitis, not one only, but repeated attacks of bronchitis, and a continuance of cough.

4229. If the miners left the work in which they are engaged with bronchitis, would they equally, if they caught bronchitis in any other occupation, bring on the same state of disease?—Not unless it was repeated, and then it would have that effect.

4230. Are you of opinion that working in the mines is likely to cause a repetition of that disease?—Very likely. I think that it is the nature of the occupation which causes repeated attacks, and I think, also, that climbing is an additional cause.

4231. Have you examined any of these patients especially?—Yes, I have examined their chests; we have but few opportunities of examining, and particularly of making post-mortem examinations.

4232. Have you had any opportunities at all of making post-mortem examinations?—No, I cannot say that I have had any of which I could give a distinct and proper history.

4233. Do you find that amongst any other class of the population anything like the same kind of disease prevails?—We find the same kind of disease occasionally among the people who have been exposed to similar causes.

4234. In your parish are the cases which mostly come under your notice those of miners?—Yes, it is a mining district hereabout, and those who come under my care are frequently miners who suffer from this disease.

4235. Do you ever meet with them in an early stage?—Yes, occasionally.

4236. Have you known any cases in which they have recovered?—Yes, but that is not in an advanced stage of the disease. I think that if they were removed to some other calling the disease could be prevented from proceeding to an extreme.

4241. (*Mr. Austin Bruce.*) Then their work must have something to do with the causes affecting their health, arising either from its severity or the conditions under which it is carried on?—I think it is from the nature of their occupation.

4242. What should you specially point out as that part of their occupation which produces the most injury?—I should say, first, it is from working in bad air, and from their coming up in an exhausted state from their work; coming out of a hot atmosphere and being subjected, under those unfavourable circumstances, to external cold, which is very likely to produce bronchitis and lung disease.

4243. I suppose that a large portion of them suffer from a combination of those causes?—Yes. I think that the irritating effect of the powder smoke is another cause by irritating the mucous membrane of the chest.

Mr. William Pace.

4260. (*Chairman.*) Do they come to you in that state?—Sometimes; not in an incipient state. They have become so much improved in health in the last few years that they are quite a different race of men to what they were when I first came to the district 25 years ago, and that has taken place since we have had the mines better ventilated, and have had the man-engine at the mines.

4280. With regard to the miners' disease, what do you consider that proceeds from?—I think that it comes on from cold, but they are more careful than they were. Formerly they would come up from the hot levels, and wash their breasts in cold water, and sluice themselves over with it, and put their feet and legs in cold water, and wash their arms in it; but now they do not do that, they now use warm water.

4281. Is the warm water provided for them?—Yes, they may get it.

4282. But is it provided for them?—They can get it when they like from the engine.

4283. The men can fetch it from the engine?—Yes.

4284. Would it not be better to have a regular washing place provided for the men?—It might be; but perhaps some of them would not have recourse to it.

4291. (*Mr. Austin Bruce.*) You have given a most gratifying account of the state of the health of those who are under your charge. Do you believe that the miners are as healthy and as long-lived as the population who are not employed in mining?—I think so about this district. I saw a man yesterday, who was 72 years of age, a miner, and who went underground at the age of 11, a hearty hale-looking man.

4292. He must have worked for a great number of years during the time when the mine was less well ventilated, and when there was no man-engine?—Yes.

4293. So that his constitution must have been a remarkably sound one?—Yes.

4294. Taking the average, have you at all compared from the materials which must exist in the neighbourhood, the length of the miners' life as compared with that of the agricultural population, and those engaged on the surface of the ground?—I think that they are about equal now. We have many miners in our neighbourhood now who are working, and taking their duty, and performing it as well as young men; they are between 50 and 60.

Mr. Francis Barratt.

4532. (*Mr. Davey.*) What improvement do you consider has taken place in the condition and health of the miners during that time?—I think that the miners, generally speaking, are supplied with much better air than they were formerly.

4533. Do you think their condition is altogether better?—Yes; I think that they are longer lived, and that they enjoy better health.

4534. Do you recollect in your younger days seeing the miners in their large frieze great coats in the towns sunning themselves when in a state of consumption, and coughing constantly?—I have seen them certainly.

4535. Do you ever see the same thing now?—No.

Mr. Francis Puckie.

5161. (*Mr. Holland.*) Are miners as a class a healthy race?—You cannot expect miners to live as long as other men.

5162. Why do not they?—I suppose it is by working in poor air.

5163. Why do you think that they are not a healthy class?—I suppose that it is perhaps by working in bad air, and so on, undergound; the air is not so pure as it is on the surface, of course, not in some places. I do not see why it should be otherwise than that.

5164. Is that true of the Fowey miners as of others?—They are just the same as other miners in the county, taking the county through, I believe.

5165. Do you know other miners generally as well as Fowey miners?—Yes, they change; perhaps a Fowey miner may be here and there, and down west, perhaps, in two or three months.

5166. And the Fowey miners are not much better than the others?—No; they are just like them.

Charles Barham, Esq., M.D.

5234. (*Chairman.*) Is the subject of the miners' disease ever a topic of discussion between others in the medical profession and yourself?—Yes. The influence of mining occupation becomes a topic of discussion when miners are attended. When I have to meet medical men in consultation, who are in attendance on mine agents or on miners, the influence of their particular occupation becomes a considerable element in the discussion as to the nature of their case; but I should say that by far the largest proportion of the diseased conditions of miners does not come very much under the observation of the hospital physician: it is rather a deteriorated state of health, which does not immediately bring them to the hospital, which tends to shorten their lives very materially as compared with the rest of the community; perhaps they die off without ever becoming patients in the hospital; and they are not, perhaps, very much patients even out of the hospital.

5235. Is there a general agreement, in your opinion, amongst the medical men as to the nature of what is called the miners' disease?—Yes; I should say pretty generally. Some persons have particular views as to the causes in the earlier stages of the disease, and the particular character of what is, perhaps, called miners' consumption; whether it is more of the nature of what is called tubercular consumption, or whether it is the result of inflammatory changes in the lungs, and so on; but there is, generally speaking, no essential difference prevalent upon the subject.

5236. What would you describe as the miners' disease, in your opinion?—My own view, as far as the facts have come under my notice, is confirmatory of what I had occasion to state more than 20 years ago, in 1841, I think, when I reported before. I had then had a pretty large opportunity of seeing the mining population, both in the mining districts of Devonshire, in the neighbourhood of Tavistock, and in Cornwall; and my opinion remains the same, namely, that there are two large sections of the diseases of miners which are, I may say, essentially distinct; one, the diseases of the young miner in early life up to, perhaps, about 25, which is partly ordinary consumption,—what we call scrofulous consumption, such as might occur in the general body of the community, and especially in those who are shut out from free access to the air, and who are exposed to mechanical causes of irritotion of the lungs, and other agencies which tend to ripen the seeds of consumption rather speedily, and to interfere, perhaps, with the full development of the body. And there are also at that age a large amount of inflammatory affections of the lungs, such as arise from rapid changes of temperature,—what we call bronchitis and pneumonia, pleurisy, and so on, and occasionally spitting of blood. And secondly, what is more properly miners' consumption, which finishes the originally healthy and sound miner when he gets perhaps to be from 40 to 50 years of age, and upwards, which is a slow disease, the result of his occupation purely, I think, as being the effect of impure air and the inhalation of mechanical particles,—irritation of the lining of what we call the bronchial tubes,—the air tubes; and also the effect of climbing to a considerable extent, too great a strain upon the heart and upon the chest. Those two classes of disease require to be kept distinct by any person who would investigate the effect of mining occupation, both on scientific grounds, because they are capable of being obviated in very different degrees. You may say that a very large amount of mischief is done (at least that is my own opinion) by subjecting boys at very early ages to the influences which they must sustain when they go underground. That is a conviction which I hold very strongly, that in the growing age, the early age of life, it is much more prejudicial comparatively than it would be at a later age, to introduce them into places in which the air is very impure, in which their physical powers are overtaxed, in which their digestive organs are very much thrown out of sorts, and in which their natural course of development is seriously interfered with. That, of course, was an element with which we, in that early commission with regard to the employment of children, had a good deal to do. The employment of very young boys underground was a thing which it was

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my duty to point out as one of the practices which might be very properly corrected in this county.

5237 You have referred to the inhalation of mechanical particles, will you explain what those particles are?—There is a great deal of carbonaceous matter in the first place from the burning of candles and from powder smoke.

5238. (*Mr Holland*) The imperfect burning of candles?—The imperfect burning of candles. Then there is a certain amount from the operations of the miner,—dust and so on,—but that is not so considerable. There is a large accumulation in the ends which are not within reach of efficient ventilation. You may say that a mine is like a chimney if you get into a corner, if you get into an end; the ventilation may be very good a little way off, but the end itself is rather beyond the point which is ventilated: this is constantly the case in mining operations. You have to carry on the operations beyond where efficient ventilation yet exists, and in those situations after blasting, and to some extent even from the mere burning of candles, there is an accumulation of carbonaceous and other particles, and there is also a great deterioration of the air from the consumption of oxygen, and the increase of carbonic acid.

5239 (*Chairman*) Do those particles affect the bronchial tubes, or what part?—They affect immediately the bronchial tubes, and in some measure the minute vesicles—the air vesicles—the more minute structure through which the air acts upon the blood, and the impure air deteriorates the quality of the blood, and so far depresses the power of life. It is a constant occurrence in such places that the miner for a long time after he comes up spits black stuff. Any persons going down for some time, mere civilians, going down, if they choose to stay long enough, say six or eight hours under ground, and get into these ends, will find that they spit this black carbonaceous matter. That is got rid of pretty readily in the first instance, and perhaps in the earlier years of the men's mining, but I believe that gradually the contact of these particles damages the delicate structure of the air tubes and vesicles, and that the secretion which throws that matter off is lost; and the older and healthy miner, in my opinion, gets damaged very much by that cause, by the repeated effort to spit up this carbonaceous matter, just as any one might do from inhaling dust for a long time. He gets rid of it naturally by expectoration for some time, but if he had to do it day after day, the texture of the lining of his air tubes would become injured, and the lungs themselves would be damaged in consequence. The miner has a species of disease which lessens his power of expansion of the lung, and in many instances he dies of a chronic consumption; but in other instances by a sort of want of breath, a contraction of the lung without any great amount of destruction.

5240 Is there any injury arising beyond the mechanical injury from the powder, is any noxious gas created by the powder which is injurious to health?—Not seriously. I should say that though such gases are commonly generated they are not seriously noxious in our mines.

5241. I mean by an explosion of powder?—There are sulphurous acid and different gases which are noxious; but I do not think that they really constitute a material element in the injury done to the miner; not anything seriously so.

5242. Supposing the candle to be made of any deleterious material, would the inhaling of that be likely to be injurious?—Yes, it has been found so in other mines, such as in some of the Scotch collieries, it has been found in a very marked form, but I do not think that anything considerable is to be attributed to it in our Cornish mines as far as it has come under my own observation. There is some difference in candles, but it is not a very material thing.

5243 Have the candles in this district ever been analysed at all?—I think not. I do not recollect any analysis. Of course bad candles are disagreeable, but I do not consider it at all an important matter in relation to our mines. The influence of climbing is one very essential element, I have no doubt.

5244. Supposing that a man working in good air had to climb 200 fathoms, would that be injurious to him?—It would be the most fatiguing part of his day's work.

5245 I mean as affecting the air tubes of the lungs or the heart?—In early life it would tend to produce some injury to the heart; I should say in a general way, that diseases of the heart are not frequent amongst our Cornish miners. Diseases of the heart have been supposed and stated, I believe, to be frequent, and one great cause perhaps of mortality. My own experience contradicts that; I believe that what we should professionally call disease of the heart is not common; I have found the effects on the heart of great exertion very marked in young subjects; the heart is in a state in the first place of palpitation, the young miner likes to go up pretty quickly if he is climbing a ladder, and will run a sort of race with his comrades. Then of course they are like persons running a race up hill, there is a violent beating of the heart induced, then the heart gets, to a certain extent, stretched, it gets exhausted by the time they have finished the race, and if you were to examine one of the miners on his coming to the surface you would find that the heart was exhausted and acting very rapidly and feebly, and sometimes irregularly. If you were to see a party of miners who had just come up, especially the younger ones, you would find that to be the case in a marked degree. Then the subsequent result of that is, that as the part exercised gets an increased nutrition, in consequence the heart gets enlarged and beats strongly. But the miner does not complain of that: I have frequently examined young fellows, whose hearts when they have come to the hospital have been beating strongly, whose cases would perhaps be set down as diseased heart in a London hospital, and who would not themselves be sensible of anything going wrong; they are accustomed to the heart beating a little strongly, but that is a condition which a period of rest will do away with, it should not be called disease, it is the effect of causes which no doubt will tend to injure the heart ultimately, but it is not really a diseased heart. The old miner is not frequently subject to what is technically called disease of the heart, disease of the valves of the heart, it is a comparatively rare occurrence; but the effect of climbing is doubly injurious, it causes, from the amount of perspiration and of exhaustion, a very great susceptibility to the impression of temperature and to catching cold, and so on, and a large portion of the pulmonary diseases of miners, especially of those of the younger miners, are in fact inflammatory diseases, which may be caught in that way, inflammation of the lungs and of the air tubes, bronchitis as it is called. A very large amount of the disease of the younger miners is of that nature; the exhaustion from climbing affects doubly in that way, it causes a liability to other diseases, and it produces in itself a weakness of the heart, and an inability to resume labour with the same advantage, and some interference with the digestive powers as well.

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5246. Is there a thickening of the membranes of the heart?—No, not of the internal parts of the heart, it is rather an enlargement of the heart with some degree of thickening of its walls

5247. As you state that the climbing and the work below render a man peculiarly liable to cold, it is important that he should have on coming to the surface a proper place to change, so that, as far as possible, catching cold may be obviated?—Yes. A recommendation was introduced into the former report of driving a shallow level to the changing place from the shaft where the men come up, so that they might come into a warm changing house where their clothes could be dried; I think that since the time when that report was written, considerably more attention has been paid to those matters, and at that time the man-engine had not been introduced at all. It strikes me that it would be a very important thing to ascertain what the effect of the introduction of the man-engine has been as regards the health. My own impression is strongly, that it has been very beneficial as regards the prevalence of pulmonary disease and general disease amongst the miners, and that opinion has been supported by the reports of some of our most able mine agents, the late Captain Jennings and Captain William Francis, who were both very able men, and Mr G. Michell, of Redruth; they all reported to me some years ago, and I drew up a paper on the subject, representing the favourable influence which had resulted from the introduction of the man-engine, in reference to miners' consumption, and to the general affections of the chest of the miner. That has been much more extensively introduced now.

5248 How do they judge of that improvement?—They judge partly from their observation of the men

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and partly from the results on themselves; Captain Jennings was the agent at Tresavean, one of the largest mines which we had at that time, and one of the deepest, it being 340 fathoms from the surface, and he was afterwards at Seton; I think he was agent of another large mine; he had been a patient of mine some time before, and had had an affection of the lungs, induced by climbing, as I considered at that time, and he was very well satisfied of it afterwards. After the introduction of the man-engine he was able to resume his work without difficulty, and he stated to me, in a report, that he was satisfied that he should have added many years to his life had the man-engine been introduced before; that a number of men who had been employed in that mine had been able to be put underground again who had been obliged to give it up, and so on.

5249 You have stated that a captain was able to go below ground because instead of climbing the ladder he had a man-engine, although he was previously affected? —Yes.

5250 Would that not be the case with many other men who with the man-engine would be able, though affected, to work below ground, which they would not have been able to do if they had not had a man engine; and therefore would not there be fewer men put off work although there would not be fewer men, in fact, affected by disease?—Unquestionably. A certain amount of disease would be consistent with their continuing at work, because the climbing being the most difficult part of their work, if a man's breath was short he could not climb, perhaps a comparatively slight disability would prevent him from climbing from a great depth, whilst he could continue, if he could just be relieved from that one difficulty.

5251. Therefore in any inquiry as to the number of men who were obliged to leave the mines from disease that would diminish the number, because there would be so many who could continue to work?—Certainly.

5252. So that it does not follow that the climbing produces the disease, but the man-engine may enable a diseased man to work longer in the mine?—It does not follow from the particular evidence that the climbing produces disease; but there is sufficient evidence of another kind, that the climbing naturally tends to produce disease both by exhausting the general power, and particularly by exhausting the heart and also causing, from the act of climbing, a great stretching of the lung, because the miner has to keep the chest as a fulcrum for motion; he must keep the chest pretty full when mounting, and that causes one affection of the chest to which the miner is to some extent subject, what we call dilatation of the bronchi, and emphysema, though, in my opinion, that is not a prevalent disease among the miners. There may be perhaps some portions of the lung which may be subject to the emphysema, which consists in the breaking up of the minute vesicles or air cells; that may occur in detached and small portions of the lungs, but it would be difficult to ascertain it exactly without post-mortem examination, which is very little practised among our miners as compared with other artizans. The miners object to it. That minute emphysema can hardly be distinguished during life; but what would be recognised as emphysema elsewhere has not been a prevalent disease under my own observation. There is very little expansion in the upper part of the lung in the disease of the miners, and there is not that resonance which there is in an emphysematous lung.

5253. Would the climbing tend to produce that disease?—The climbing would tend to stretch the air tubes, and there may be other causes which perhaps would be a set off against that.

5254. (*Mr. Holland.*) Then do you consider the existence of emphysema of the lungs rather hypothetical? —I do.

5255. (*Chirman.*) Have you ever turned your attention especially to the examination of the emphysema?—We are constantly examining the chest. My own experience is that there is not, generally speaking, a very resonant chest in the miner who characteristically has the miners' disease; he has a rather contracted chest; the upper part of the chest does not expand, it is more like what occurs in chronic pleurisy.

5279. (*Mr. Kendall.*) More in olden time than now?—I have hardly the means of making a comparison. It has certainly struck me that the amount of cases of that sort has lessened of late, that has been the impression on my mind, and it has been rather confirmed by statements which I have had from mine agents and mine doctors, that the condition of things has improved; but that I believe applies more to the great mines in the central districts, and so on. The outlying mines, I am inclined to believe, are often very bad in that way.

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5286. (*Mr. Holland.*) He was speaking of the class which the miners themselves called consumptions because it was accompanied by a cough and a spitting of blood, and a wasting away, but which he believed to be quite distinct from tubercular consumption?—A miner has of course very imperfect evidence as to his own case, he calls it consumption if he finds himself failing; but I believe the class is quite distinct to the medical man. There is a large class of cases which probably would be entered on the register of deaths as consumption, but which to the medical men are not consumption, they are chronic inflammation of the lung. The proper consumption, which is a very prevalent disease among the younger miners, is the ordinary consumption.

Capt. John Webb.

5315. (*Chairman.*) Do you think that miners generally suffer in health from their occupation?—Yes.

5316. Have you observed them suffer yourself?—Yes; They suffer from bad ventilation in many cases; I do not say in every case, and they suffer from climbing too fast; that is their own fault.

5410. It is your opinion that the health of the miners would be considerably benefited if the mines were properly ventilated?—Yes.

5411. Is bad ventilation, in the mines which you have visited, more general than good ventilation?—No. I think that there are more men working in good average air than in bad. It is at the extreme points that it is bad.

5412. Then it is your opinion that there are many ill-ventilated ends?—Yes.

Mr. William Petherick.

5562. (*Mr. Kendall.*) In those cases the men, I suppose, suffered?—Yes, some little; sometimes it was owing to the stuff not being taken away.

5563. There was so much stuff in the end that they were overcrowded by it?—Yes, it was so, sometimes, and very often that occasioned a close atmosphere.

5564. What was your experience as to the health of the miners while you were there?—They were generally very healthy.

5566. What has been your experience as to the miners; were they as strong as the agricultural labourers?—They were shorter lived, and not so strong.

Mr. Richard Quiller Couch.

6443. (*Chairman.*) Will you be kind enough to describe to the Commissioners the nature of the miners' disease as far as it has come under your observation?—The first indications of ill-health are very obscure, extremely gradual in development; so gradual that the miners themselves never acknowledge it. You will find that the first symptom, perhaps, of the disease will be a pain at the pit of the stomach, or an inability to climb the ladders with the usual rapidity; the muscular power becomes less than it has been in times past, and then, if I keep them at grass for a fortnight or three weeks, I find that they regain that muscular power, that they say that they are able to climb the ladders again with the same elasticity as before, and they will go on in that state for years without any apparent diminution of health, if the air be good.

6444. You say that they will go on in that state for years; but if they return again to mining do they suffer a relapse?—Yes.

6445. Do you, as a medical practitioner, when they come to you suffering from ill health, advise them to give up mining for a time?—Frequently, and especially if I find they are not improving under treatment. I find also—for I have had 1,100 or 1,200 men weighed—that if, before going down a mine, they are weighed in the same dress in which they come to the mine, and are then work underground for six or eight hours, and are again weighed in the same dress, they have decreased in weight very considerably on coming to the surface, and if, the next day, I find that they have not regained the weight which they lost the day before, I advise them immediately to stop.

6446. That is in the case of those men who consult you as patients?—Yes; it is not the case with all miners that they regain on going down the second day the weight they lost the day before; but taking the average of all the mines in this district, or the 16 or 17 where I got the captains to weigh the men for me, and taking into account the shallow workers with the deep workers, the decrease is about 3 lbs. and 3 quarters; but if the deep workers only are taken into consideration the decrease in weight then amounts to very nearly 6 lbs., and sometimes more than that. With regard to the captains who go underground only occasionally, I find that they sometimes decrease in weight from 10 to 13 lbs. in the same number of hours.

6454. (*Mr. Kendall.*) As I understand you, it is beyond all doubt that the miners, as a body of men are less healthy than either the agriculturists or fishermen?—Very much so. Even healthy miners are more frequently on the sick list than other labourers.

6459. Can you suggest any other causes which you think affect their health?—The first is, I think, a want of ventilation below the surface; that I think lays the foundation for all the mischief. That is why I think that the men apparently in the enjoyment of good health, become blanched, their skin becomes sallow, and frequently assumes that kind of appearance which Dr. Addison calls the bronzing of the skin; and on examination, in several cases in which they have sustained injuries to the hand from jammings, I have placed the blood under a microscope, and I have found that the red corpuscles are very pale, and very much shrivelled, showing a deficiency of blood power. That is before they give any indications of disease, or before they complain.

6465. What do you mean by the terms "unfairly had"?—I mean that there was a single shaft, and the mine was worked into a deep pit, the levels running east and west of it, without any other ventilation, and very few winzes; and the health of the men was very bad.

6466. That would appear to have arisen from a desire to save money at the expense of the men's lives?—I will not give any opinion upon that; but I should hope not. The adventurers lived out of the county.

6467. You say that there were no winzes, or very few? —There were very few and only one shaft.

6468. (*Chairman.*) Who was it that prevented you going down that mine?—The gentleman is dead now; but I could never get access to the levels, and even after I was appointed surgeon I never could get an opportunity of going down nor obtain any return of the ages of the men; in fact, I could get no information from the mine except what I got from the men.

6481. (*Mr. St. Aubyn.*) To a considerable extent?—Not to such an extent as you might expect to find. I found those cases more at Camborne than here, where the mines are deeper.

6501. (*Mr. Davey.*) Have you found any difference in the health of the miners during that time?—Yes; I think that they are improving.

6502. Do you think that they are improving much? —Yes. I think that the young men do not show the same indications of disease that the old ones have done.

6538. Have you been so fortunate as to be able to make many post-mortem examinations?—Not so many as I could wish to have made.

6539. How many have you made?—Not more than 30.

6540. In how many of those 30 cases do you think there was tuberculous deposit?—I should think in perhaps about half, or rather more; I should observe that they were selected, or at least I rather pressed the matter because I thought there was tubercular disease. The first few cases that I examined were tubercular, and in those cases that I thought tubercular, I rather pressed to have them, and I found that they were so.

6541. The number of cases in which there was tuberculous deposit would be above the average?—Yes, it is not a fair average.

6559. (*Chairman.*) Do they go at a younger age to the mines now than they did formerly?—No. I think that they go underground at 10 years of age. I have known two cases in Balleswidden go underground at eight years of age; but that is an exception. I inquired of Mr. Young, at St. Ives, and he told me that the health of the miners was the same precisely as it had been when he was a young man; he is connected with the old deep mines; but his experience and mine do not agree on that point. I find the miners better in health.

6562. Is the health of the miner likely to be more affected if he goes underground at the age of 10, or if he goes underground at the age of 17; in other words, would he become more accustomed to it by going underground younger?—That varies very much. If an agricultural labourer goes underground at the age of 23 or 24, and works in a deep part of the mine, he is more rapidly affected than a man who has been working in the mine from a boy.

6586. Would it not be very desirable that something in the nature of a dispensary should be established at which the men could obtain relief?—Yes. There is one class of disease to which no reference has yet been made, and that is diseases of the stomach. I have found in my experience that before any disease of the chest occurs the stomach becomes disordered, and the miners complain of pain in the head; to such an extent does the stomach become affected that they cannot bear any pressure. This has struck me besides disease of the chest, and there is a general disinclination to work on the part of the miners, for there is great prostration of the nervous system; the pulse beats not more than 48 or 50 in a minute, the depression is great. I believe it first arises from the stomach.

6587. From breathing bad air or poor air the miners become first affected in the stomach?—The first visible effect has been in the stomach. The appetites of the miners then become very much impaired, and they are incapable of taking that food which is fit for them, and in fact, the foundation of very serious illness is laid.

Mr. James Richard Quick.

6651. (*Mr. Holland.*) Is there a much larger proportion of chest disease among the miners than among the other men?—Yes; I have here the 16th annual report of the Polytechnic Society, which contains a paper on this subject from St. Just, and which shows that out of 63 deaths of males above 10 years of age, 34 were from diseases of the chest, and of these 28 were miners and 6 not.

Capt. Thomas Trahair.

7021. (*Mr. Kendall.*) From your experience amongst miners and their mode of proceeding, do you not think that a great deal of their illness arises from want of care?—A very great deal of it. I certainly do think so, and I am candid about it.

Mr. Alfred Chenhalls.

7143. (*Mr. St. Aubyn.*) From what you know of them, do you consider them to be more healthy than miners in other districts in the county?—Yes, I do, especially as compared with the Redruth district where I have mining property.

7144. Upon what do you found that opinion?—Upon the knowledge which I have obtained by a pretty extensive acquaintance with them as to the numbers of really infirm persons whose health has broken down early in life, and from my intercourse with the miners who have come into our neighbourhood, and who formerly worked there.

7145. Have you found that the miners who have come from other districts were in better health, while working in the St. Just district than in other places?—I have presumed as much, because they confess that they have less water in the mines, and consequently they are not so subject to rheumatic ailments as they are in the eastward part of the county where they are almost amphibious.

7149. Will you be kind enough to state briefly to the Commission what are the causes in your opinion of that difference?—In the first place, I would say that, as compared with other districts, in the tin mining districts the heat is not so intense underground; I have every reason to believe that our winzes are sunk here more numerously than they are in the average mines in the country.

7153. Do you know whether are many more old men working in your mines than it is usual to find in other districts, or whether the men are older who are work-

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ing in the mines?—I have never had an opportunity of judging from statistical information, but the number of wind-broken people about Redruth who are unable to go underground, and are suffering from bronchial or consumptive complaints, seems to be vastly greater than in our neighbourhood.

Mr. Richard Burford Searle.

7609. (*Chairman.*) Have you at all turned your attention to what is called miners' disease?—Yes; a number of miners come under my care in our mines and neighbouring mines.

7612. How many at the present time have you off work from disease of the chest?—I cannot say. There is not a large number by any means. I know that there is one man who I think is about 60 years of age, he is laid up with an affection of the chest. I think it is nearly 20 years since he went underground; the symptoms frequently lie dormant for a long time.

7613. Have you any men now working underground who have been to you and have gone back again?—Yes, numbers who are permanently short breathed are now working.

7615. By what cause do you think that this is occasioned?—By a local irritation, not constitutional disorder like phthisis, it is vastly different. The pulse of miners' decline is frequently short, frequently shorter than natural. This statement would apply solely to the first stage or period of irritation and spasm; the heart's action not only becomes depressed in tone, but its frequency affected, frequently intermitting, either due to reflex action or deficient arterialization of the blood, probably a combination of both. In phthisis it is a quick pulse.

7616. In your opinion by what is this occasioned?—By irritating matter lodging in the air cells.

7617. Is that matter which is drawn into the lungs while working in the mine?—Yes; unconsumed carbon.

7618. Anything else?—Not that I am aware of. It is very black. I have seen a man after an attack of inflammation spit up the best part of a quart of black matter in the course of 24 hours.

7620. How long after he had been up from the mine did you observe this?—I think that that man had not been working underground for 10 years; the matter had been lying there all that time until an attack of inflammation ensued, and then you got it loosened and thrown off. I was struck with the large quantity thrown up. That man is dead now.

7621. Was this matter ever examined by a microscope?—No.

7622. You could not furnish us with the name of any man with whom that is likely to be the case now?—No. I have a case now where a man has not been working underground for 20 years, and yet he spits up black matter, but not the same quantity.

7623. The man who you say is 60 years old, and has not worked underground for 20 years, still occasionally spits up black stuff?—Yes.

7624. (*Mr. Kendall.*) Does he smoke much?—I am not aware that he does. I have not seen him smoke.

7625. (*Chairman.*) Do you think that the effects upon the miners arise from the carbon and not from the air or from climbing the ladder?—Yes; I believe that they arise from the carbon. The men get contraction of the air passages, and they are in a state of chronic asthma, they are asthmatic. If you sound a man's chest, you get a clearer sound on percussion than is natural certainly in the first stages; in the last and third stage, when ulceration has taken place and the air cells become filled with purulent matter; as also in the second stage, when there is permanent contraction of the bronchi from thickening, the sounds on percussion are proportionably dull, which is quite the reverse of phthisis.

7628. (*Mr. Holland.*) Do you think that miners are under-fed as a rule?—I believe that their food is not the best calculated for them; miners are a great deal subject to indigestion.

7634. Do a larger proportion suffer from rheumatism?—No.

7635. Is there any excess of disease among the children?—Yes; 50 per cent of the deaths in this parish, I believe, are of children under three years of age.

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7636. Are you well assured of that?—I was looking over my list to-day, and I came to that conclusion. It is remarkable how the children die off here.

7637. (*Chairman.*) Is that conclusion drawn from the register, or from your own observation?—From my own observation.

7645. (*Mr. Kendall.*) As far as your experience goes, do the children of the miners die more under the three years of age than the children of the agriculturist?—Yes; most decidedly.

7646. To what do you attribute that? Why should a miner's child be more subject to die under three years of age than the child of an agriculturist?—Because the father is generally in a more infirm state of health. The state of health of the miner tells upon the offspring decidedly.

7653. And you began as soon as you could begin?—Yes, I was the first man of our college of my year who took out the double qualifications, so that I did not lose any time. I came here as an assistant to a mine surgeon first. It is generally the rule here to nominate the surgeons to the mine. The mine surgeon frequently lives out of the place, and he gets some one to fill his place for him; that is done in many cases by unqualified men.

7654. (*Mr. Holland.*) You mean not legally qualified?—Not legally qualified.

7655. (*Mr. Kendall.*) Generally speaking, as I understand you, or very frequently this is done, and as the adventurers have the appointment of surgeons, some men get appointed who live at a distance?—Yes.

7656. And they supply their places by unqualified men?—Yes. I may say that I am a miners' surgeon, but not a mine surgeon.

7662. At what age do miners generally become broken in health?—It varies from 45 up to 55.

7663. They are but little broken in health before 40?—They are weazened for years before they get laid up.

7664. They do not begin to break in health until after 35 do they?—No; it is very seldom that you find a man much affected in breath before 35.

7665. And not very materially until after 40?—No.

7670. (*Chairman.*) Have you anything else which you wish to state?—As regards death, I have met with one case of death here by poisoning from arsenic.

Mr. George William Bevan.

8218. (*Chairman.*) Are you able to say that the men under your charge here do not suffer from miners' disease?—Not so much as in many places.

8224. Then are the Commissioners to understand that there are no cases of men working in the mine in this district who are affected in their breathing?—There is only one man that I am aware of in the mines that I have attended, and he is a man who has been subject to attacks of bronchitis for several years, he continued working underground rather too long, but still he is capable of following his labour.

8234. Do you perceive any difference in the health of the agriculturists as compared with the miners?—There is not that difference now that there was some years since, in consequence of the improved ventilation of the mines, and also in consequence of the miners paying more attention to themselves than they did formerly; the miners generally speaking have become more moral men in all their habits and conduct.

8239. Are there any such instances within your knowledge?—There is one mine that is not now working—the Gew mine.

8240. How long has the working in that mine been stopped?—For two or three years.

8241. Was that mine not well ventilated?—No, it had only one shaft.

8242. Had you charge of the mine at that time?—Yes, partly, several years since, and a great number of persons suffered.

8243. (*Mr. Holland.*) What did they suffer from?—From miners' disease—pulmonary disease.

8266. But what should you consider was the average age of a miner?—From 50 to 55. I see a great number, and we had an old man working in the Providence mines some time since of the age of 75; there is a vast difference in the health of the miners in the copper and tin mines.

8267. Are you prepared to state to the Commission, as the result of your experience, that the miners are nearly as long lived a race of men as other labourers?—In this district I think they are.

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8268. Do they suffer in a very marked manner from lung disease, as compared with other labourers?—That depends entirely upon the mines in which they work.

8271. What is the form of lung disease from which they suffer?—Generally speaking, and very often, it assumes the form of tubercular disease.

8280. Do they throw up liquid blood?—Yes, immense quantities.

8281. Is that common?—Not so common as it was some years ago in this neighbourhood, and not so frequent as it is in the neighbourhood of Redruth; because they find more arsenic in the copper there than we do here.

8316. (*Mr. St. Aubyn.*) How many sick persons are you looking after now who are connected with mines?—Not one.

8341. (*Mr. Holland.*) What effect do you suppose the arsenic produces?—It produces sore gums and dreadful blotches all over the body when a man has worked in copper mines.

8342. Have you observed among them sore eyes?—No.

8343. Any irritation of the nostrils?—Yes, very much so, very often.

8344. Is any skin disease produced?—Yes; and gatherings and blotches.

Capt. MATTHEW CURNOW.

8632–3. (*Chairman.*) Do you know any men who are alive who have suffered from working in the mines?—It is a very rare thing with us anywhere in the neighbourhood; during the last 10 or 15 years the mines have been getting better ventilated, and the health of the men is more studied now than it was 30 years ago; they study the health of the men, and one man thinks more of another.

Capt. CHARLES THOMAS.

8830. (*Mr. Holland.*) I believe it is your opinion that the miners as a body are more healthy than they were 20 years ago?—Yes.

8831. Why do you believe so?—I do not see so many of them going about in consumption as I used to do; we do not find them on our club books; they decline, but not with consumption.

8848. (*Mr. St. Aubyn.*) To what do you ascribe their improved health and longevity?—Better ventilation generally, and from better provisions being made for the men to change their clothes before going underground, and after they come up. There are warm places provided for them in which they can dry their clothes.

Capt. THOMAS RICHARDS.

8963. (*Chairman.*) Have you observed that the men have suffered at all in their health from working underground?—Yes, they suffer from the air, and some constitutions are knocked up more easily than others.

8964. Do you think that the air is the principal cause that affects their health?—A good many constitutions cannot stand water, and there are some miners a number of hours in the water.

8965. You mean when they are working in wet mines?—I mean when they are working in wet ends, or in a shaft where the water is always two feet deep that you are standing in, or 18 inches.

8966. You think that that affects the health of the miners?—Yes; some men cannot stand it.

8987. (*Mr. St. Aubyn.*) Are you of opinion that the miners, generally speaking, are now in better health than they used formerly to be?—Yes.

8988. To what causes do you ascribe their improved health?—I ascribe it first to this, that there is more attention paid to the comfort of the men when they come up from underground. I think that it is very dangerous to come up from a deep mine, and then going anywhere to change. I think that they should keep up a moderate temperature until a man cools down; that I think would be a great advantage in the changing houses. I think also that the miners do not drink nearly so much now as they used to do.

8989. Is the ventilation of the mines improved?—There is more attention paid to ventilation no doubt.

8995. (*Mr. Kendall.*) Referring to the health of the miners, do they live much in their cottages here or not?—In towns I think they must.

8996. Do you think that that at all injures their health?—Certainly, if they have not sufficient sleeping berths it must be injurious.

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8997. Is not that a matter that has been somewhat neglected in this county, and do not the men herd together in rooms, and sleep in too small a space?—Yes, and it is a great misfortune in many ways.

8998. It is pernicious both as to their morals and as to their health?—Yes, it is very bad altogether.

8999. You have had great experience in other parts of the county besides this immediate district?—Yes, more out of this district than in it.

9000. (*Mr. St. Aubyn.*) You are a western man, are you not?—Yes, but I speak generally of mines.

9001. (*Mr. Kendall.*) Do you think there is a want of good arrangements as to sleeping apartments of the miners?—Yes, I think there is a want of that.

Capt. JOSEPH VIVIAN, North Roskear.

9104. (*Mr. St. Aubyn.*) How many years have you been connected with mines?—I am now 70, and I have been in the mines ever since I was 12 years old.

9105. Nearly 60 years in fact. Is it your opinion that the miners as a class are more healthy now than they were when you began?—Yes, considerably more so.

9106. From what cause?—I think that one great cause is that formerly they never carried down provision with them, nor water; but in the last 20 years there has always been a fresh supply of water brought to all the mines from the wells about; it is first-rate water, and they have it sent down to them, or they carry it down in their canteens, it depends upon the depth that they have to fetch it, and they carry down their dinner with them. I think that is one cause of the improvement. And I think that the mines are now better ventilated than they formerly were. I also think that the footways in the mines are kept better than they were; they are kept away from sharp draughts, and the water is kept away from them. They are all drier, and there is every accommodation. They have a comfortable house, with a constant supply of warm water running through it, for them to wash in when they come up. Here every man keeps his own soap and towel, &c. They are all expected to go away clean; they wash themselves clean, and they wear better clothes than they used to do; they used to be without stockings and things of that sort, which is now out of the question. They went away dirty, the same as the German miners do now; but now it is altogether a different thing, and I think that that has improved the health of the people very considerably.

9134. (*Mr. Davey.*) You have mentioned that you consider that the health of the miners generally has been improved very much?—Yes.

9135. Do you recollect when you were a young man a number of men who went about the town with great coats on complaining of the miners' disease?—Yes. I recollect a disorder which seems to have gone from the country, men in decline. I should think that nearly 50 years ago there were a great many young fellows that went off in decline.

9135*a*. You used to see them about the streets in the summer time with great coats, laid up with the miners' disease?—Yes.

9136. You do not see anything of the kind now?—No, not at all.

Mr. JOHN RICHARDS.

9620. (*Mr. Kendall.*) What is your opinion as to the general health of the miners?—I think that the general health of the miners is pretty fair.

9622. Do you know much of the agricultural population?—A good deal.

9623. Is there much difference between them and your miners?—I should say that our miners do not live so long as they do by some years.

Mr. JOSEPH JEWELL.

9705. (*Mr. St. Aubyn.*) To what do you think that improvement in their health is attributable?—It is because the mines are better ventilated.

Capt. JOSEPH COCK.

9985. (*Chairman.*) What is it which you think affects miners' health?—Of course I have my own opinion upon it, but I do not mean to say that I am right in all

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cases. I think that men often drink a little fast and injure their health, and sometimes they stay a little too long without meat, which is injurious to health. And another reason is that I believe they climb too fast. But taking it moderately in eating and drinking and climbing, I think that miners have a chance of living pretty long. Sometimes I think that foul air does it.

Mr. Philip Vincent.

10,419. (*Mr. Holland.*) If they have been some time out of the mine, do they cease to spit up black stuff?—Yes, invariably. Directly we get a man who is at all affected with anything in the shape of miners' disease, I always recommend him to get a place on the surface.

10,422. Do you think that the bronchitis is often the consequence of repeated slight colds?—I think so, and that it arises from the irritation of swallowing the dust and the powder smoke and the candle smoke. When I speak of the air, of course the air underground is made up partly of candle smoke; the candles produce a great deal of smoke. Then there is the powder smoke after blasting which they inhale.

10,423. Some of the men have complained that the candle smoke is very irritating to them; have you any remarks to make upon that?—In miners' houses, where I have found some of the candles being burnt, it is certainly very irritating; it produces almost a smother in the room.

10,467. (*Mr St. Aubyn.*) You have said, and I have heard it said before by two or three medical witnesses, that when you detect the first symptoms of the miners' complaint, if you can get them to take some occupation above ground they recover?—Yes.

10,468 And the expression used is that "they go on for years" Do you mean to say that when you take the thing in time you can make them as good and as strong as if they had never had the disease at all?—No, but it can be arrested in a measure, and very likely, if they worked upon the surface, they would live to a great age.

10,469. Supposing that you were examining for an insurance office, and that you had a man who had had the miners' disease to a small extent, and had come up, and had been working above ground a certain number of years, and was to all appearance well, should you consider his as good a life as if he never had been underground?—Certainly not

10,470. Even if he never worked underground again? No; I should be afraid of a deposit lodging about the lung, which sooner or later might develop itself.

10,471. Then it comes to this, that if a man ever is attacked by the symptoms of the miners' disease his must always be an uncertain life for the rest of his days, even if he leaves off his occupation?—Yes, I think so.

Charles Fox, Esq.

10,519. (*Chairman.*) You have for a long time taken an interest in miners, and are likewise connected with mines?—Yes.

10,520. Will you be kind enough to mention to the Commission any points to which you think they should turn their attention, particularly with reference to the sanitary condition of the mines?—As I have often stated in public and in private, we are entirely deficient in any statistics on the subject. We do not know the extent of the evil, either as it regards accidents, or disease, or death amongst the miners. It is only here and there that you glean some statistics on the point, and by the labour of individuals. We have no record, as far as I know, of the accidents which occur, whether fatal or otherwise, nor any account to be depended upon of the mortality amongst the miners as a class—no safe record. Great pains have been taken in the different parishes, but after all it is like groping in the dark to a certain extent. I regret that our medical men have kept no accessible record of the cases in the mines which have been specially under their care. We go to the union house, and there we see a record of all the cases which are under the care of the medical man; how many weeks a man has been ill, and what the nature of his disease was; and, although he does not keep any record of the medicines, he tells you when he orders extra diet; but we have nothing analagous to that in our mines, and I should conceive that there would be no practical difficulty in having such a record kept. I have gone further, and urgently recommended that a register should be kept of every person employed in the mines, both as to their ages and the circumstances under which they were living, especially if at a distance from the mines. At such a place as Camborne this applies in part only, as the residences of the population are in the midst of the mines. Sometimes the miners have to go a distance of three and four and even five miles, although that is much less the case now than it formerly was. I do not know whether, amongst the inquiries of the Commissioners, they have obtained any evidence of miners as to their suffering from the length of a core and eight hours shift or not. I think it would be an advantage to the miners if there was a medical inspection, more or less periodically, of those working underground, in order that the commencement of disease might be detected before it becomes illness. It might be thought needless, but I think that that system has told eminently well in the military service.

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Mr. Thomas Hutchinson.

10,551. (*Mr. Holland.*) I believe you are clearly of opinion that miners' consumption is distinct from common consumption?—That which passes under the name of miners' consumption is certainly not tubercular phthisis, at least a great number of cases that are registered for phthisis are not tubercular phthisis at all, but they are a combination of various complaints, bronchitis, emphysema, and disease of the heart, but they are registered under the head of phthisis, as it is a short term and easily recorded. I expect that is the reason.

10,565. Do you think the dust is a frequent cause of injury to them?—Yes, in many cases; the dust and the powder-smoke, and the frequent colds which they catch, indeed there are many causes; it is not any single cause.

10,566. Have you observed that the miners are particularly subject to dyspepsia?—Yes, I think they are.

10,568 They say that their appetites are temporarily destroyed when working in hot air; do you think that is so?—Yes, I think there is no doubt of it. I frequently find them complaining of loss of appetite, when working in hot places.

10,569. Will not that produce weakness of digestion afterwards?—Yes, no doubt of it; but I think it is as much attributable to their food.

10,570. What fault have you to find with their food?—They take boggan down with them, and that is very heavy food; it is a solid mass of flour, mixed with water, and baked without any leavening at all.

10,571. It is like a lump of heavy pie crust, but even heavier?—Yes.

10,572. Why do they prefer that?—I think because it is more convenient to carry underground.

10,591. (*Chairman.*) Have you any suggestions to make by which the causes from which miners suffer by working underground might be modified? If the climbing up the ladders could be done away with it would be very advantageous; they evidently suffer from climbing, from want of ventilation, from the powder smoke, and the dust. If the levels could be made wide, these and the ends better ventilated, and the climbing done away with, the condition of the miners would be much improved.

10,603. (*Mr. Holland.*) There being twice as many among the males as among the females of the same?—Yes, the total number of deaths amongst tin and copper miners in the 531, was, from all causes, 55, and the deaths from phthisis amongst those were 30.

James Jago, Esq., M.D., Oxon.

10,618. (*Chairman.*) From your observations in the examination of miners, should you say that their illness was the effect of working in impure or poisonous air?—Looking at the anæmic and pasty colour of the miner, which is very peculiar, and other facts as to his breathing, and I have seen them come to me excessively weak, when I have been unable to detect any special cause to account for their want of breath and general weakness, excepting the mere absence of the red colour in their features; the unfavourable condition under which they work alone seems to me sufficient to account for the great deterioration in their strength, and very likely for their gradual decay, bringing on premature old age, and I think a loss of their vital power or force.

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10,624. What size is the infirmary at Truro?—I think we make up 64 beds.

10,625. Is the infirmary large enough for its district, do you think?—It is not large enough since the railways have been opened. We are always full of late.

10,626. What number of cubical feet of space is allowed in proportion to the number of beds?—I cannot answer that question, although the space has been measured. The infirmary is not altogether well built.

10,627. (*Mr. Holland.*) Is the infirmary small in proportion to the number of its inmates?—The beds are too much crowded to please me, while the old wards are not high enough.

10,628. I suppose there is no doubt that miners are specially liable to lung disease?—I have no doubt that they are. I always examine a miner's lungs, and expect to find some mischief there; if not consumption something else, with which they seem to drag on for years.

10,629. Have you seen many miners suffering from distinct tubercular consumption?—I have seen a great many young miners, and several older ones so suffering.

10,630. Have you seen many miners with lung disease that was not tuberculous?—Yes.

10,631. A large proportion?—Yes.

10,632. Do you think it likely, from the miner's mode of life, that they will suffer from an unusual amount of bronchitis?—I think it is likely that they will.

10,633. You do not know that they do, from your own knowledge?—I am inclined to say that they do suffer from bronchitis more than the average of the labouring people. Special classes appear to me to suffer more than they, but they more than the average.

10,634. It has been stated in evidence that a very large proportion of the miners die from lung disease, which is called consumption, and includes all sorts of lingering disease, with cough and expectoration. Can you give any evidence as to what that disease generally is?—I instanced the case of Collins, to give you an idea of what kind of case might be registered as such a case. All such cases, I think, are so registered. There are a great many cases of pleurisy among miners.

10,637. A thickening of the lining membrane of the bronchial tubes has been mentioned as a very frequent circumstance; does that correspond with your observation?—I have never had an opportunity of examining the bronchial tubes. Still I find miners with black mucous expectoration, which may arise, for what I know, from what they breathe in the mines—carbonaceous matter, which had adhered to the lining membrane.

10,638. Do you think that that may arise from the smoke?—I suspect that such cases do occur among others. I think that the lungs get irritated by breathing very likely dusty matter in the mines and the gunpowder smoke, and that these irritate the bronchial tubes, and among other things, tends thus to damage the miner's health These, combined with the anæmic state they get into, from the peculiar conditions under which they breathe, certainly weaken the miner, and make him at last worth little as a man of work; but I have rarely had an opportunity of following these men to ascertain whether they die soon from such declining health.

Mr. John Permewan.

10,657. (*Chairman.*) Have you formed any opinion as to the pathological condition of the patients?—Yes. I think, in describing a case of miner's disease, that we have an opportunity of seeing it at the beginning. Very frequently a man comes complaining first of symptoms of indigestion and dyspepsia; that is the first symptom that we find, with headache and loss of appetite, and vomiting frequently; throwing up his food. He also complains of pain over the epigastrium, and in a very short time he complains of his breath being short, and the heart beats irregularly; there is palpitation. I think I might say that for the first three weeks or two months there is no cough; but after that they have a short hacking cough, without any expectoration.

10,658. (*Mr. Holland.*) How long does that condition last?—That is at various times; it may go on; it all depends upon the character of the man's work If he is still working in the same place it will be for a very short time before expectoration will take place; if he goes out of the place where he has been working, and is properly treated, and gets rest, he will get better in that stage.

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10,659. (*Chairman.*) Have you ever known a case in which where a man has been shifted from the particular end in which he was working to another level a good effect has been produced?—Yes, decidedly

10,660. (*Mr. Holland.*) From changing to another level?—Yes, there has been a decided change at once. We ask the miners how long they have been working at such a place?—They say three months, perhaps, and then we say that they ought to get out of it, and they say, "We expect to hole in a fortnight." After that time they go into purer air, they get on very well indeed, and it passes off entirely if they get into purer air. We find that these dead or poor places are generally in a winze or in a shaft.

10,661. Is the effect equally good whether they change their place of work or not, provided the air be improved?—Yes. I think so, there is no doubt about it.

10,662. (*Chairman.*) Do you ever advise men to leave mining work altogether, and to go to the surface?—Yes; frequently that is our recommendation, if we see that they are able to do so They ask us whether we think they had better do so, and we always recommend it, if possible.

10,663. Do the men who come to you in that state spit up a good deal of black sputa?—Yes; that is the first character of the expectoration; it is frothy stuff, mixed up with black particles; what it may be we cannot exactly say.

10,664. How long after leaving his work would a man continue to spit up that black stuff?—I have known it for years, and I think I could point out to you two or three people now I know one in particular, and I know that he has not worked underground for 10 or 15 years, and he has every characteristic symptom of the old miner; he spits up now black expectoration. His name is John Cock

Capt. Joseph Vivian

10,735. (*Chairman.*) But you have visited mines abroad?—Yes, I was in the Brazils about five years.

10,736. Were you working there?—Yes, in Gongo mine

10,737. Did you suffer at all from working there?—No, I have been working underground 30 years.

10,738. In other parts of Cornwall?—In the neighbourhood of Camborne principally, North Roskear.

10,739. Did you ever know a man suffer from working underground?—No.

10,740. You never met with any man who suffered?—Not any one.

10,741. Then you do not think that the men do suffer from working underground?—None that ever came under my experience.

Mr. James Wearne.

10,895. (*Chairman.*) During your experience as surgeon have any men come under your notice affected with what is called miners' disease?—I do not know what miners' disease is.

10,896. Affected with consumption?—Knowing of course that I was coming before you to-day I looked about among my patients to see whether I could find a case of consumption, and I am not sure that I could find one.

10,897. Are your patients affected with any illness specially applicable to miners?—I think that that would depend in a great measure upon the depth at which the men were working

10,898. Is there any peculiar illness to which miners are subject?—Not one that I know of.

10,899. Do you think that there is any one disease not peculiar to miners but which prevails amongst any number of miners?—Yes, I should say bronchitis, they suffer from chronic bronchitis.

10,900. Is there any other disease?—I do not know that there is.

10,901. Have you observed the case of any miner in an early stage of the disease, and watched its progress till he has died?—I am obliged to do so.

10,902. In those cases it is bronchitis?—I think so; you may have a little dilatation of the air cells, for

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instance, and it may ran into asthma; but I think that since we have become better acquainted with the stethescope, and the proper examination of the chest, we have not so many or are not likely to have so many cases reported as consumption

10,903. In your opinion what is the state of the disease when it first shows itself in any miner working underground?—I should think that it was congestion of the mucous membrane.

10,904. (*Mr. Holland.*) You mean congestion of the lining membrane of the bronchial tubes?—Yes.

10,905. (*Chairman.*) What is the next stage after a man has been affected which the disease assumes?—You would get inflammatory action, and you would get a very large discharge in some instances—great expectoration; in others you would not; and you might get ulceration, and you would get the air cells and air tubes closed up, and you get dilatation of the bronchial tubes, which of course would render a man less able to labour. You would then in the end of the matter get the heart disordered, and have, more especially, perhaps, dilatation

10,906. What is the nature of the expectoration in the earlier stage?—Generally a yellowish mucus.

10,907. Does that increase as the disease goes on?—It is not always that the form of the disease is exactly alike in every case, you may have cases of chronic bronchitis with very little expectoration.

10,908. But where it proceeds so as at last to endanger life or to prevent the man working, does the expectoration ever show anything peculiar?—Nothing tubercular. They spit up a great deal of powder smoke, as we call it. I have seen the same thing in blacksmiths when they have been working at the smithies and so on; but it is very remarkable for how very long a time a miner will spit up this black stuff after leaving a mine, and after having been ill for months

10,910. (*Mr. Holland.*) That is about the limit, is it not?—That is, as well as I can recollect. I cannot give any limit to it. I could not say, for instance, that I had seen it after the men had been away 12 months or six months. I think that within six months you may see it.

10,914. (*Chairman.*) At what age should you say that they are generally affected?—I should say about 45; from 45 to 50 you find them beginning to fail in that way very much.

10,922. Do you think that a holiday is important for recovery?—I think so, very frequently.

10,923. And would that tend to complete recovery?—I do not think that it tends to perfect recovery It might tend to it if a man was put under very favourable circumstances at once, but a man is very much relieved by his holiday. When once affected, I do not think they ever become perfectly sound again, or not frequently

10,924. But by working on the surface they may live a long time?—Yes, and do very well.

10,925. But if a man so affected went down to work again, what would be the period of his existence?—I cannot state. It would depend upon how far the disease had gone; but I am giving you my practice towards the men. I am always very anxious when once they have thorough chronic bronchitis to prevent their going underground at all.

10,926. Then it is your opinion that the disease from which they suffer is chronic bronchitis?—Yes, and the consequences which would result from chronic bronchitis.

10,927. (*Mr. Holland.*) What do you think that it commences with? Do you think that it begins with irritation of the bronchial membrane?—Yes

10,928 Followed shortly by thickening or congestion of that membrane?—Yes.

10,929 Is chronic bronchitis an early disorder?—I think that you would get common bronchitis, and that when the miner had worked on with the same symptoms you would get chronic bronchitis You would get larger expectoration, which you would not have so much at first.

10,930. Does the effort to expectorate without being able to do so often continue a long time?—I do not know that it does very long.

10,931. A month or two?—Yes, I dare say that it does, but I have never had an opportunity of watching as to its duration. I fancy that after a man has been labouring under disease of the lungs for a considerable time it rather disappears when he begins to have a free expectoration. The membrane also possibly gets thinner, I think, after there has been very free expectoration from it; but the bronchial cells would get dilated, for instance.

10,933. You have spoken of the heart being disordered; do you think that that is a consequence of the lung disease, or independent of it?—I think that it is a consequence of it.

10,934. You think that it is in consequence of an impeded passage of blood from pulmonary circulation?—I think so; that the heart participates in the disordered state of the lung, the lung not performing its functions well.

10,943. What do you think is the cause of the irritation of the bronchial membrane?—I think that the smoke and dust would be the most likely causes, the carbon and particles from blasting, and so on.

10,948. Have you noticed any great improvement in the health of the miners during the 30 years that you have practised here? Do they break up later in life than they did?—I think that they do I think that our men are rather better than worse.

10,951. Is that a very strong impression?—Most decided in this neighbourhood. In Breage, for instance and those neighbourhoods, I think that our men are better men at 50 than they used to be. I do not know that the cause is to be attributed to any improvement in mining. I think that there are other reasons for it.

10,952. To what do you attribute that improvement?—To better clothing, better living, and better habitations.

10,967. Do you observe any difference between the state of health of the miners and the agriculturists?—The miner has generally less fat about him,—less flesh about him, so to speak; but he is generally more muscular.

10,968. (*Mr. St. Aubyn.*) He is in a better condition?—In one sense he is

10,969. (*Chairman.*) Is he in a better condition to resist disease?—No.

Mr. John Henry Lambrick

11,643 (*Mr. Holland.*) You have, I believe, been in practice here as a surgeon for a long time?—About 12 years

11,644. Have you seen a good deal of the miners' complaint, that complaint from which they generally suffer?—Very frequently, and continually those cases fall into my hands.

11,645. Are you of opinion that there is a marked distinction between what is called miners' complaint and phthisis?—I think so.

11,646. Have you any doubt about it?—No; it is a bronchial affection principally, and we call it miners' consumption I think that it is decidedly a bronchial affection.

11,647. Have you often seen pneumonia mixed with it?—Very often in its earlier stages

11.648. What do you think is the first morbid condition; bronchial?—Yes; and then the substance of the lung is afterwards attacked.

11,655. Do you also attribute it to alternations of temperature?—Yes.

11,656. And to the powder smoke?—Yes; that is one element decidedly.

Capt. James Phillips.

11,775. (*Chairman.*) Do you enjoy good health?—I believe very good.

11,776. Do you feel yourself very well?—Yes I have been working underground all that time, and I have been underground every day.

11,777. Have you ever been in the doctor's hands?—No, not for anything particular, to say anything about.

11,778 Do you go underground now?—Yes, sometimes every day in the week, always three and four times in a week; the last week in a taking I go underground every day; but I suppose on an average four days a week.

11,779. You go underground on an average four days a week throughout the year?—Yes.

Capt. William Skewis.

11,973. (*Chairman.*) Have you ever known any of the miners to suffer from working in those ends?—I have known men to suffer, but not in Orelake.

(A.)—HEALTH AND DISEASES OF MINERS.

Mr. Richard Sleman.

18,942. (*Chairman.*) Do you know a disease peculiar to miners called "miners' disease"?—Yes; but if you take certain districts it is not very rife. At Mary Tavy it is not, although it is a deep mine; you get more at such a place as Gunnislake and Beer.

18,943 Do you think that the overcrowding of the dwellings also tends to the increase of what is called miners' disease?—Yes, I think so; very much.

18,944. You think that a man is in an unhealthy state owing to his habitation?—Yes, you have that superadded to the other drawbacks upon him. First of all he has irregular hours, then when he gets home he has a miserable place to sleep in; he may he sleeping in the same room as that in which his wife is washing in he same day.

18,945 At what age do you think that this miners' disease generally attacks a man?—At various ages, about 40, I think, sometimes; but there is very little of it in Mary Tavy.

18,975. (*Mr Holland.*) Have you seen much of the miners' disease?—No, except at Gunnislake.

18,976. You have not seen it down the country?—No

18,977. You cannot compare the prevalence of it here with it in the Cornish districts?—No, not at all I believe that it is influenced a little also by the strata. I believe that where the men are working in granite they get it worse than in killas; it used to be so in old Gunnislake mine very plentifully; that was in granite Perhaps the prevalence of the disease is also influenced by the miners themselves; there is less intemperance among them.

18,978 Is it a marked disease among the miners?—Not in Wheal Friendship; not in Mary Tavy district.

18,979 It is so in Tavistock?—Yes; and in Gunnislake.

18,980. A very large proportion of the men who are ill have that disease?—Yes.

18,981. Three-fourths?—No, nothing like that. There is such a proportion as that you would notice it, but it is not so at Mary Tavy.

18,982. What are the chief causes to which you attribute it?—There are several causes; one frequent cause is boys going up the deep levels too rapidly; that is a predisposing cause, I think. Then another cause, I should say, is the irregularity of the hours at which the men work, the irregularity of their sleeping hours, sleeping by day and working by night, and I should also mention the dwellings. I believe it is admitted that in mines which are in granite the men suffer more than in killas. I have never heard it accounted for.

18,983. The system of using changing houses for drying their clothes has been introduced in your time, has it not?—Yes

18,984. Has it produced a marked improvement in their health?—I think that that must have been the natural result.

18,985. Do you think that they suffer much from dust?—No

18,986. Do they suffer much from smoke?—No.

18,987. Do they complain much of it?—They complain of bad air; but what they call bad air I believe is what they take at the public-house; working in bad air, I believe, has been working at the public-house more than anything else.

18,988 (*Mr Leveson Gower.*) Of the different mines with which you are connected, which, in your opinion, is the worst for miners' disease?—I should say that the Gunnislake mines are the worst.

18,989. Those are not as deep as Wheal Friendship?—No.

18,990. As to ventilation, are they worse ventilated than Wheal Friendship?—The mines about Gunnislake, except Wheal Maria, are not so well ventilated as the other mines; they are newer mines, and in some instances machinery has not been put up nor shafts put down in sufficient number; they have been obliged to use air machines.

18,991. Therefore though less deep they are worse ventilated than Wheal Friendship?—Yes, and worse for the men to work in.

18,992. Do you apprehend that the miners are as long-lived as the agricultural labourers?—In certain localities they are, in other localities they are not. I think that at Mary Tavy they are as long-lived.

Mr. John Sparham.

(A.) *Health and Diseases of Miners.*

19,390. (*Chairman.*) Are you the medical officer to the union?—I am the medical officer to the district.

19,391. How long have you been in this district?—About 18 months.

19,392. Are you attached to any mine?—The Devon New Consols. That is closed temporarily.

19,393. Have you miners employed at other mines who come to you?—Constantly.

19,394. Do they pay for themselves, or are they paid for from the club of the mine?—Some pay for themselves, and some from the club of the mine, and some fall on the parish. I get them in three ways

19,395. Have you any men affected differently from other labourers?—Yes; there are different forms of disease with them.

19,396. Have you ever been down a mine?—No.

19,397. Have you ever had a post-mortem examination?—No, fortunately not, since I have been here.

19,398. How should you say that the miner was affected?—I think from a want of proper ventilation of the the mine the miner's lungs become affected.

19,399 In what way does that show itself?—Generally in the form of pneumonia.

19,400. Have you had an opportunity of seeing them them in different stages?—Yes.

19,401. In the early stage how does a man suffer?—He complains of a tight pain in the chest, and a slight cough, and it runs through his form: a rusty expectoration sets in, which in a few days changes to white, and they recover in two or three weeks

19,402. Have they a cold?—They complain of cold, but I am aware that it is pneumonia.

19,403. Can you at once tell?—I at once treat them for it.

19,404. Do you see any difference on account of the particular mine in which they have been working?—I think that from the Druid, as we call it, that is to say, the Devon New Consols, I get more than from any other on account of the depth, it is an immense depth, and there is only one shaft to it. I get more men with pneumonia from that mine than from any of the others.

19,405. Should you say that it was increased from the want of ventilation, or from the climbing?—That I cannot say, I have not had sufficient experience to say, but I have had more of it from that mine than from anywhere else.

19,406 When you find a man affected in that way do you advise him to give up work?—Directly

19,407. Have you known cases where they could resume their work with impunity afterwards?—I have hardly been here long enough to answer that question.

19,408 Do they generally give up?—They give up directly I order them.

19,409. Had you ever seen similar cases of men affected by working in mines before you came here?—No. The coal pits do not produce that sort of thing

19,410. What is the eldest man that you have had as a patient affected in this way?—A man about 50. The men generally run about 25 to 30, here, I should think.

19,421. But before the mine was stopped, you had men?—Yes, constantly coming to me with slight pneumonia and bronchitic attacks, which I attributed to their being in the foul air more than anything else. They complained that after they had been in this foul air for some time, they had a pain in the chest, and this went on for some days, and then they came to me with pneumonia evidently. How far the ladders might conduce to that by their having to climb up 600 or 700 feet, I cannot say.

19,422. How did they describe the first feeling of the symptoms?—An oppression in the chest.

19,423. Was the head affected at all?—Not much. They did not complain so much of that.

19,425. (*Mr. Holland.*) Is this disease very slow in its progress?—No; it is about two or three days before it gets to its climax, when treated at the commencement of the attack

19,426. What is the end of it?—The end of it is that resolution sets in, and they have a little rusty expectoration, and they get about again.

19,427. Do they have it again?—Yes; I have had one or two with a return of it.

(A.) Health and Diseases of Miners.

19,428. Are they very liable to relapse?—That I can hardly say. I have not been here long enough to say. I have had one or two relapses. It seems to me that deficient ventilation is the cause which does so much mischief to the men.

19,429. (*Sir Philip Egerton.*) What opinion have you formed of the general health of the district, exclusive of the miners themselves; of the families of the miners, for instance?—My opinion is that we are excessively subject to disease of the lungs here; that is to say, the general population, men, women, and children.

19,432. Are you inclined to attribute the prevalence of consumption and lung diseases to the air of the district, or to the overcrowding of the habitations?—I think it is to be ascribed to the air of the district—the constant changes of temperature that we are subject to.

NATHANIEL JOHN HAYDON, Esq., M.D., L.R.C.P.

19,543. (*Chairman.*) How long has the Yarner Mine been worked?—Between 6 and 7 years.

19,544. What is the ore raised from it?—Copper.

19,545. What is the deepest level?—40 fathoms; they are now sinking on the 50.

19,546. Is the mine a wet mine?—It was formerly a very wet mine, the water coming in on the men from the upper part of the workings; this arose from the nature of the ground. It is now very much improved; a steam pumping engine has been lately put up.

19,547. Did the men suffer at that time?—Yes, they were very sickly.

19,548. Are they improved in health?—Yes, but they are still sickly.

19,549. What do they principally suffer from?—Pectoral disease, such as bronchitis, inflammation of the lungs, and rheumatism.

19,564. Have you ever had opportunities of investigating the diseases of miners except in those mines?—Yes. I formerly resided for four years in Cornwall, where I had frequent and continual opportunities of seeing and studying the diseases of miners; and some years since I had the medical care of a mine (lead mine) in Hemnock.

19,565. Have you known any cases of miners' asthma?—Yes; I have seen many who have suffered from it, I have one case under my care at present.

19,566. How does it begin?—With slight difficulty of breathing and cough, depending on bronchial irritation; the amount of difficulty of breathing and cough necessarily differs in different individuals; in some cases the cough is nearly always present, dry and harsh.

19,567. (*Mr. Holland.*) How does it proceed; and what are the sounds on percussion and auscultation?—The circulation becomes affected and you have increased frequency of pulse with more or less palpitation of the heart; a very harassing cough. You have a loud respiratory sound, but a dulness on percussion; this after a time is followed by a state of extreme exhaustion; the sufferer appears to waste away; his pulse becomes much slower; and in this state of sinking, or almost living death, he may and often does go on for several years.

19,568. Is there any black spit?—Yes, a black spit is a frequent symptom of the second stage of the disease; it is called by some authorities carbonaceous bronchitis or black phthisis.

19,569. Have you formed any opinion how black spit is produced?—I imagine it to be a carbonaceous deposit from the blood, produced in the lung, mainly dependent on a long continued breathing of bad air in imperfectly ventilated mines.

19,570. Is it your opinion that a free and perfect ventilation of mines is necessary to prevent miners' asthma and black spit?—I believe a free ventilation of the mines, conjoined with a good "change" and "dry," are the essentials for preserving the health of miners.

9,571. Is black spit never produced by other causes than by bad air?—I have seen black spit in a gentleman now a patient of mine, who was never in a mine in his life. He suffered for some time from a troublesome bronchitis, and for the last two years has shown "black spit." It has been examined microscopically by some eminent London men; and we came to a perfect conclusion, that in this case he had a carbonaceous deposit, and not a malignant disease. I do not know what produced it. It is a very common thing to find black matter in the lungs and bronchial glands.

19,572. Are you aware that some high authorities consider "black spit" to be a melanotic deposit?—I know there are a variety of opinions in this matter. The peculiar characteristic is the black matter. Messieurs Foy and Thanard from their analysis affirm it to be a highly carbonized insoluble matter, supposed to be altered colouring matter of the blood. Dr Fyfe is of the same opinion. Dr. Cessell calls the black appearances spurious melanosis. Professor C. J. B. Williams says the production of black matter may co-exist with various modifications of the nutritive process, * * * * as in the peculiar combination of black with opaque caseous matter, not unfrequently found in the lungs and bronchial glands, but, agreeing with Andral, he hesitates to class simple melanosis with malignant growth. I have not seen Professor Virchow's work; but I am informed he considers the deposit to be melanosis, and that Professor Goodsir coincides in that view. But without doubt two of the best papers on this subject are to be found in the Edinburgh Monthly Journal of Medical Science, 1846, by Dr. Makellar; and in the Edinburgh Medical and Surgical Journal, 13th vol., by Mr. Graham. It is here shown to depend essentially on the smoke from the lamp suspended from the miner's head while at work; to the inhalation in confined mines both of the carbonic acid generated in the pit and of that expired by the labourers themselves; and also the inspiration of heated air after the explosion of gunpowder required in the works in which float carbon and carburetted gases.

The "black spit," which is after all one of the most serious complications of disease to which miners are liable, inasmuch as it is a symptom of a grave, intractable, and incurable pulmonary affection, has been long known. Haller relates it, so does Bayle and Laennec (Herbert's edition, 1846, p. 355, 71), under the name of Melanosis; but M. Andral in his notes to Laennec (op. cit. p. 822, 23) very distinctly combats this view, especially in the case of miners, and he relates instances of miners who have been killed by violence, and who through life had exhibited no signs of pulmonary disease, had on post-mortem examination been found with extensive black deposit in the lungs.

In Copeland's Dictionary of Medicine, vol 2, p. 787, this disease is well treated of under the title of Spurious Melanosis.

In the Cyclopædia of Practical Medicine, vol, 3, pp. 97, 98, 99, 100, there is a most valuable paper from the pen of Dr. Carswell, "Spurious Melanosis," *from the introduction of carbonaceous matter.* He relates the case of two miners. The first of whom was a patient in the Royal Infirmary, Eding., and died there; he relates the P.M. appearances, and the analysis made by Professor Christison of the black matter. 1. Concentrated nitric acid boiled on it did not alter the colour. 2. Immersion in a strong solution of chlorine had no effect. 3. A strong solution of caustic potass boiled on it took up some animal matter and filtrated very slowly. 4. He subjected a small portion of the black powder left after the action of the boiling nitric acid, well washed and dried, and introduced into a glass tube with a ball, to the action of a low red heat a considerable quantity of gas, which had the odour of coal gas, and on the approach of a light took fire and burnt with a dense white flame. In the tube a dark yellow fluid likewise condensed, which had exactly the odour of impure coal tar naphtha, and became a soft mass on cooling of the consistence of lard. This, when compressed between layers of filtering paper, yielded an oily stain to the paper, and left a white matter, which dissolved in boiling alcohol, but appeared again on cooling in the form of minute obscure crystals. Dr. Christison remarks on this, "It is scarcely possible not to recognize the ordinary products of the distillation of coal;" and Dr. Carswell said, "The result of this analysis does not permit a doubt as the to the origin and nature of the black discoloration in the case;" but Dr. Carswell suggests that while there can be no doubt that these black masses are due to the inhalation of carbonaceous matter "*is it not more probable that the accumulation is determined by a morbid state of the lungs themselves?*"

It is impossible not to be struck with this question of Dr. Carswell. The almost habitual breathing of bad air necessitates the fact that the blood is never properly decarbonized from a want of a proper or sufficient quantity of oxygen; carbon can only combine with a given proportion of oxygen; carbonic acid is carbon in combination with the largest proportion of oxygen

(A.)—HEALTH AND DISEASES OF MINERS.

Health Diseases of ners.

which it is capable of combining with. But the action of oxygen does not simply stop when it has combined to form this carbonic acid; another proportion of oxygen is required to cause the removal of the carbonic acid itself. In a deep mine or badly ventilated mine you not only have not sufficient supply of oxygen for these purposes of healthy life, but you are continually consuming oxygen by the lights which are necessary, and so continually adding to the quantity of carbon and carbonic acid, the lung is in a state of almost habitual congestion, and soon acquires that morbid state suggested by Dr. Carswell. It is well known to practical miners that "tribute men" who work in what is comparatively good air are freer from disease and longer lived than "tut men" who work in bad air, A very excellent paper on the influence of respiration on the blood is to be found in "Stevens on the Blood," pp. 1 to 162.

19,573 What practical conclusion would you deduce from these facts?—That no mine can be worked with a proper regard to the health of the miner that is not most freely ventilated; that in all mines, in addition to air shafts, there ought in all cases to be a series of winzes sunk, not as now for the purpose of profit to the mine, but for the purpose of ventilation, and so of health and life to the men.

19,574. Have you had any cases of miners with tubercular phthisis under your care?—Yes, and I found it aggravated by working at the mines; one man in particular was a labourer who took to mining after he was 30 years old, and he soon knocked up I have seen many agricultural labourers take to mine work, but they cannot stand it long without illness.

19,575. As a rule do you consider that tubercle is produced by that condition described as miners' asthma?—On the contrary, while miners' asthma is frequent, tubercle is a rare disease amongst miners; it certainly may co-exist with the asthma, but is not produced by it. There is too a curious but very important distinction, for in the advanced stages of the asthma you get a very slow pulse, in tubercular phthisis you get a very fast one.

a.) De se of eight in king under- und.

(a.)—DECREASE IN WEIGHT IN WORKING UNDERGROUND.

Mr. Richard Quiller Couch.

6446. (*Chairman.*) That is in the case of those men who consult you as patients?—Yes; it is not the case with all miners that they regain on going down the second day the weight they lost the day before; but taking the average of all the mines in this district, or the 16 or 17 where I got the captains to weigh the men for me, and taking into account the shallow workers with the deep workers, the decrease is about 3 lbs. and 3 quarters; but if the deep workers only are taken into consideration the decrease in weight then amounts to very nearly 6 lbs. and sometimes more than that. With regard to the captains who go underground only occasionally, I find that they sometimes decrease in weight from 10 to 13 lbs. in the same number of hours.

6447. What is the greatest decrease that you have known to take place in the weight of a working miner?—About 7 lbs.; but in that mine they have been going from a shallow level to a deep one; after that the decrease in weight becomes greater; before that the decrease has not been so great. The nearer they are to the surface the less they decrease in weight, I think I have small books provided I have arranged in a tabular form. I have given them to the captains, who have weighed the men on going down, and then entered their names and weights, and when they come up again they have weighed them again.

6448. The utmost loss of weight which is recorded is 7 lbs. in the case of a labouring man; what has it been in the case of a captain?—In the case of Captain Thomas Roberts there was a decrease in weight of 10 lbs, and in the case of another person the report made to me showed a decrease of 13 lbs., but he was a very stout man.

(b.)—AGE AND APPEARANCE OF MINERS.

(A. b.) *Age and Appearance of Miners.*

Mr. William Richards.

1031. (*Mr. Kendall.*) Are most of the men whom you have working now young men, or are some of them old men?—Some of them are young, and some old, that is to say, moderately old; perhaps the oldest man would be 45, and there are some as young as 22; from 22 to 45 would be perhaps, about the average.

Mr. Thomas Trevelyan.

1136 (*Chairman.*) I see that 54 is the greatest age?—Yes, there are two of the age of 54; the youngest is 18.

1137. Are there any boys?—I have none less than 18, and only two at that age.

1138. Is that because you do not allow them to go down, or because you think that they cannot work sufficiently?—I prefer men.

1139 As more efficient workers?—Yes.

1140. Are there any of those men that you are aware of who complain of shortness of breath?—Not one; I do not know an individual among the lot who does so. There are 70 men, who average from 54 down to 18, the average being 32 and 2 months.

Mr. Richard Quiller Couch.

6564. (*Chairman.*) Have you arrived at any conclusion as to the ages of the working men in the mines?—I have published one or two short papers on that subject, from the returns I have obtained at the request of Mr. Fox; he wished me to publish them to the Miners' Association, and I think I may say that the average age of the males engaged in underground work is rather below than above 30. At St. Just I find that the average age, including the timber men is 28; but but excluding the timber men, the average age sinks down to about 26 and 27. Some time ago a gentleman connected with mining, said that he could not believe it. His son was appointed under the Census Act to take the census of that district, and I asked him to make a return, which he said he would do. He told me afterwards he was sorry to have to report that the average age of the whole of the miners in St. Just was 26.

Mr. George William Bevan.

8264. (*Chairman.*) Are they a short lived race?—I think that within the last few years they have become longer-lived than they were formerly—in the early part my time the average age of a miner was considered about 35 or 40.

8265. What is it now?—A great many of them have died in this district at the the age of 80.

8266. But what should you consider was the average age of a miner?—From 50 to 55. I see a great number, and we had an old man working in the Providence mines some time since of the age of 75; there is a vast difference in the health of the miners in the copper and tin mines.

8267. Are you prepared to state to the Commission, as the result of your experience, that the miners are nearly as long lived a race of men as other labourers?—In this district I think they are.

Capt. Charles Thomas.

8835. (*Mr. Holland.*) I find that out of 481 men, tributors, tutwork men, and pitmen, there are only 40 above 45 years of age now at work?—I do not remember the exact number; but we have a larger number of young people in Dolcoath mine now than in any other mine that I am acquainted with. The number has doubled during the last ten years. We have taken them from our dressing floors, and brought them up for miners; for three or four years we could not get men to work in all the places, and we got them in as boys to work with two men, and trained them in that way. We have a larger number of young men in Dolcoath mine on that account than in any other that I am acquainted with; the old men, or those who were comparatively old, emigrated; as they had not moved away from the other mines to come to our mines, they had remained where they were, but these young men are very steady and there have been a great number brought in from the dressing floors, lads of 15 or 16 years of age, and they fill up the mine.

(A. b.) Age and Appearance of Miners.

8862. (*Mr. Kendall.*) Is the return which I have before me an accurate return of all the men and boys employed underground in the Dolcoath mine?—Yes, if that is the list I have sent in.

8863. Notwithstanding that this is an accurate return, is it not the fact that you cannot draw correct inferences with regard to the shortness of the miner's life as compared with that of the agriculturist, for these two reasons; first, that miners when they have made a little money very frequently become shopkeepers or small farmers?—Yes.

8864. And next that the miners emigrate a good deal?—Yes.

8865. So that it is impossible from these tables to compare fairly the average length of their lives with that of the agriculturists?—That is my opinion decidedly, after having examined the matter very carefully.

Capt. William Rutter.

10,156. (*Mr. Holland.*) What do you call an old miner?—A man coming up strong in years; a man of 50 or 60 years is very old for a miner after working underground.

10,158. What becomes of the old miners; they dwindle down; they waste away in time.

Mr. Philip Vincent.

10,411. (*Mr. Holland.*) The proportion of deaths from lung diseases is rather less among young men in Cornwall than in other parts of the country?—Yes. The Cornish miner does not suffer for some time; he is a healthy, strong young man, and you could not pick stronger men for a regiment of soldiers, but by working underground they very quickly take on old age. I have remarked numbers of young men in this town who have become old men very quickly.

10,412. At about what age?—From 30 to 40. We always calculate that a miner is 10 years older than an agriculturist.

Capt. John Hancock and Mr Michael Morcom.

11,270. (*Mr Holland.*) I notice in your return that almost all your tributers are below 40; only 19 out of 94 are above 40?—Yes.

11,271. What becomes of the men above 40?—A great many of them go away upon the burrows picking a little tin, and a great many of them have help from their friends and retire. There are a great many old men in the parish.

(A. b.) Ag- and Ap- ance of M

11,272. Do not a great many of them die?—Yes, of course they die.

11,273. At what age do you look upon a miner in this district as an old man?—I can hardly tell. A great many men in this district are between 60 and 70 (I mean not working but living here). I hardly know what has become of many of the old men.

11,273*a*. What becomes of them when they get above 40?—I do not know, it requires a little time to inquire in that matter. I do not know that any of our men die before they are pretty old.

11,274. Of the 23 tutworkmen there are only 6 above 45; what becomes of the others?—I do not know. I do not know how to explain it. I do not think that it is very easy to explain it, as we have had very few deaths below that age "45."

Mr. Thomas Morris, Devon Great Consols Mine.

18,727. (*Mr. Holland.*) At what age do you consider a man young?—From 20 to 30.

18,728. What becomes of them when they get above 30?—According to circumstances, employed at surface, or shallow parts of the mine. We have some few men now who have been with us from the commencement, that is 19 years.

18,729. What becomes of the men when they become old?—Some go away; others employed at surface. We lose our men occasionally; they go abroad, or to other mines where they can get better pay.

The Revd. John R. P. Berkeley.

3212. (*Mr. Austin Bruce.*) Your general results are that 82 men of the mixed population, exclusive of miners, lived between them 5,433 years, or an average of 66 years, while 82 men of the mining population lived between them 3,134 years, or an average of 38 years?—Yes.

Agricultural, &c.		Mining.		Agricultural, &c.		Mining.		Agricultural, &c.		Mining.		Agricultural, &c.		Mining.	
Name.	Age.	Name.	Age.	Name.	Age.	Name.	Age.	Name.	Age.	Name	Age.	Name.	Age.	Name.	Age.
W. L.	36	I. H.	52	I W.	71	C. O.	51	I. J.	79	W. S.	58	I. S.	86	W. S.	11
P. H.	82	E G.	42	W. D.	62	I. E.	48	C H.	84	S. S.	52	I. G.	55	H. G.	20
I W.	30	I. H.	17	I. T.	54	H. S.	20	I. S.	77	I. R.	20	I. R.	80	I. P.	52
T. H.	52	M. T.	54	S. G.	10	I. N.	73	I L.	62	S. R.	56	H B.	81	E. V.	33
T. H.	94	W C.	82	G. T.	84	W G	65	I. H.	61	D. S.	72	S. S	54	I. H.	42
T. C.	77	I. H.	42	S. A.	59	E H	53	I. L.	63	P. D.	40	S. K	71	J. H.	21
I. R.	87	I. W.	39	G. L.	86	T. B.	44	R H.	64	I. G.	47	W. S.	71	I. P.	19
T. H.	93	I. W.	69	S G.	56	I C.	41	W B.	77	W. B.	28 killed	G. S.	62	I. W.	40
S. W.	52	W.C B	44	S S.	75	R E	48	I. S.	82	I. C.	29	S. S	52	H. T.	30
R S.	72	A. T.	27	W B.	84	R F.	28	H. B.	15	I. R.	47 killed	W. H.	87	W. S.	35
W. D.	54	H. H.	24	W B	45	I.W.A.	35	W H.	89	I. P.	52			I. M.	12
H. G.	97	I. H.	55	W H	72	I. H.	31	I S.	22	W. C.	55			S. D.	19
I. L.	64	N. T.	53	I. C.	80	I. E	32	T. H.	62	S. H.	40			R O.	22 killed
I. I.	75	S. R.	24	N. S.	70	W. S.	33	R L.	72	I. P.	14			H T.	42
I. B.	52	W. P.	53	I. E.	76	I. S	55	W K.	38	I. P.	24			I. G.	44
W. S.	13	I. R.	35	I. H.	87	W W.	11	W N.	83	N. R.	43			T. M.	33
I H.	47	P. T.	27	I. N.	70	W. T.	45	T H.	63	T. W.	25			I. S	31
R. D	60	I. L.	26 killed	I. B.	70	I. I.	53	R. S	78	W. P.	23			I. E	61
I. B.	78	H. H.	30	R. S.	66	I. R.	50	M. W.	68	I. H.	14			T. P	81
I. H.	76	W. H	28	I. B.	43	I. T.	20	S. B.	17	I. B.	45			W. W.	41
I. S	72	E. R.	55	I. H.	88	I. N.	14	I. W.	72	W. W.	61			H. R	19
W. S.	74	S. W.	52	I. T.	73	W. R.	42	W. T.	43	I. H.	16				
I. H.	80	S. H.	22	F. B.	75	W. H	42	I. R.	81	W. H.	25				
I. D.	76	I. G.	18	I. C.	88	G. B.	45	C. J.	70	W. R.	35				

(A. c.) Food of the Miners.

(c.)—FOOD OF THE MINERS.

Mr. James Nance.

2692. (*Chairman.*) In that mine, was any provision made for cooking the men's food?—We had a soup kitchen erected, with benches round for them to sit, and each man as he came from his work had a basin of soup tendered to him directly, before he changed his clothes.

(A. c.) Food of the Miners.

2693. What did he pay for it?—Nothing. Mr. Fox paid for it. Mr. Fox said, "We will go on and try it, and perhaps ultimately we shall charge the men a penny a week to cover the expense, we shall see what the expense is." And after some time, he said, "Never mind, go on."

2694. What was the effect of it upon the health of the men?—They looked much better.

2695. Do you think that they would pay a small sum

Food of ners. for it?—I do not think that they would object to pay a penny a week, and I think that that would cover all the expense.

2696. (*Mr. A. Bruce.*) Surely it would not cover the expense of the soup?—Yes, it would. That does not include firing or attendance.

2697. (*Chairman.*) You think that the men would be willing to pay a fair price for the advantage of getting some soup on coming out from their work?—I think so, if they had it once.

2698. (*Mr. St. Aubyn.*) Do you know any mine where that has been tried?—Dolcoath.

2699. Is it still continued?—I think not.

2700. The men never paid a penny a week at Dolcoath, did they?—I think not.

2701. When Mr. Fox had the management of the mine he supplied soup?—Yes.

2702. And when he left it that was left off?—Yes, I think so.

2703. But you do not know any mine where the men pay a penny a week and have their soup?—No.

2704. You, however, think that it would be a good thing?—Yes.

2705. And that the men would do so?—Yes.

2706. How much would you give them for that money, a pint of soup?—Yes.

A Miner (No. 5).

3097. (*Chairman.*) What amount of butcher's meat are you able to purchase in a week?—At the gettings which we are allowed, we cannot afford more than about 3 lbs. or 3½ lbs.

Mr. Robert Dunstan.

3579. (*Chairman.*) Do you think that they get sufficient food, considering the work they have to do?—No, I do not, very often many of them.

3580. Many men are working in low levels in a hot temperature, but they do not get sufficient food to make up for the waste?—Nor do they get the food that their appetite requires, because miners have very delicate appetites.

Mr. William Wale Tayler.

3710. (*Chairman.*) I suppose that they require an additional amount of good food to make up for the loss of that weight?—Yes.

3711. Do you think that what the miners working in that depth are able to earn is sufficient to provide them with an amount of animal food to make up for the loss sustained in working in those hot mines?—I think that, as a general rule, a miner's wages, that is to say, the wages of a tributer, are very uncertain; it must be so from the nature of his employment; it is a speculation.

3712. Therefore when he is not earning he must have less food?—He must have less food.

3713. With regard to the tutwork men, do they work in that hot temperature?—I suppose that they are not exposed to so much heat as those who are working in the deep passages, or whatever they may be termed; but I do not know much of the interior of a mine.

3714. In examining any of your patients, have you ever put the question to them as to the amount of food which they have, whether it is sufficient to keep up their strength; and can you tell us the amount of food which they obtain?—The miner unfortunately does not eat much animal food,—not the quantity which he ought to eat,—because the diet of the country is principally pasties; they make almost everything into what is termed a pasty, and they prefer that.

3715. Will you describe what the pasties are composed of?—Pasties are composed of a crust of flour and various kinds of vegetables, potatoes, and onions, and apples, and a very little meat, all combined together very frequently.

3716. In your opinion has that description of food sufficient nutritive qualities in it to make up for any great loss of weight by the exertion incident to working in a hot mine?—I think that they ought to eat more animal food, but I do not think that you could prevail on them to do so. I think that they prefer the food which they have been in the habit from their childhood of partaking of. Whatever their wages might be, I do not think that they would alter their diet. I have often remonstrated with them upon the small quantity of animal food that they consume.

3717. In your opinion they do not consume a great amount of animal food?—No; I should say not one half so much, taking the average, excepting in some very bad labouring districts, as the agricultural labourers, not, for instance, the Dorsetshire labourers, or some others, who have been prominently brought forward; but taking the average, I do not think that they consume so much animal food, and in fact they do not wish to do so. (A. c.) *Food of the Miners.*

3718. When they return home after working at the mine, from your own knowledge, can you say what they have then?—That is their principal meal; they are very fond of fried bacon and eggs, then they have what is called a supper, and they generally do not eat pasties at that time, it is more miscellaneous, broth and vegetables and bacon, and of course some meat.

3719. That is their principal meal?—That, I should say, was their principal meal decidedly on a week day.

3720. And it does not comprise much meat?—The meat is very small in proportion, it is not so much as it ought to be.

3721. Can you give the Commissioners any information as to how we could ascertain the amount of meat which ordinary miners, as a general rule, consume?—I think that it could be ascertained by taking the butchers in either of the towns, and by making a calculation of the number of butchers, and the quantity of meat which they sell, and the number of men; I made a rough calculation once, and I was quite astonished at the small quantity of animal food, considering the population.

3722. But your opinion is that, considering the work which miners do, it would be very desirable that they should have more animal food?—Yes.

3781. With respect to the miner's food—you know what their wages are—are the average gainings of the tutwork men and the tribute men such as to enable them to buy the food necessary for their hard work?—Yes; they have the means to buy sufficient food for their hard work.

3782. But you fancy, from your experience, that they do not eat animal food enough?—They do not.

3783. They have too much liking for the pasty?—Yes.

3784. Do you know much of the agricultural labourers as well as of the mining population?—I do not.

3785. You have not medical intercourse with them?—No, but I know that the men engaged in the railway consumed about three times as much animal food as the miners.

3786. I suppose a navvy eats about six times as much as you could eat?—I do not know; I consume a good deal.

3787. Are you aware that a navvy will eat as much as three pounds of meat day?—Yes; I am aware that they eat a good deal.

3788. Are you or not, much mixed up with agricultural labourers?—No.

3789. Then you can hardly enter into the comparative diet between the agricultural labourer and the miner?—No; I do know that I am competent to give an opinion upon that point; but I consider that the miner does not eat so much animal food as he ought to do.

3790. He takes his pasty underground, and it is not a healthy food in your opinion?—It is not a healthy food, and the quantity of meat in it is very small.

3791. But when he comes home in the evening he has his grand meal?—That is his principal meal.

3792. And then he indulges in fried potatoes and bacon?—Yes.

3793. Does he consume much fried potatoes and bacon?—Yes; an immense quantity; he is very fond of fried potatoes.

3794. The potatoes are boiled first of all, are they not?—Yes.

3795. And then are fried in fat?—Yes.

3796. And they eat them with bacon?—Yes.

3797. Is that a wholesome food or not?—I think it is wholesome and nutritious; it seems to agree with them very well. Potatoes are considered very nutritious.

Mr. John Pearce.

4155. (*Mr. Austin Bruce.*) What kind of food would you especially recommend for them, within the limit of their means?—I think a limited quantity of animal food,

(A.)—HEALTH AND DISEASES OF MINERS.

(A. c.) Food of the Miners.

but the great defect with regard to the miners I think is not in the character of their food so much as in the careless way in which it is cooked for them.

Mr. Richard Quiller Couch.

6590. (*Chairman.*) In this district do the miners take down into the mines with them cold pasty or bread and butter?—They sometimes take down with them bread and butter, and sometimes cold pasty.

6591. But that is a heavy thing, is it not, for the stomach in a delicate state?—Yes, it is.

6594. Do you think that the miners are amply fed?—I do not think so.

6595. I mean considering the work they do?—I do not think that they digest the food which they get, and they want a better class of food.

Mr. James Richard Quick.

6642. (*Chairman.*) Do you think that the food which the miners eat at all affects the men, or has anything to do with it?—Yes; many of them live very hardly, and are thereby rendered more susceptible of disease. Those who have health have generally very good health.

6682. (*Mr. Kendall.*) Do miners live better on the whole than agricultural labourers?—No.

Capt. R. Boyns.

6817. (*Mr. Kendall.*) Do your miners live better than agriculturists, do they spend more money on their meat?—Yes, I think that that is certain.

6818. What is the nature of their food, pasties?—No, they do not do much in pasties. They carry under ground bread and butter, and a little light cake, but I think that most of them live pretty well at home.

6819. What do they have for supper when they get back; is not their evening meal their chief meal?—Yes; they get beef sometimes, and pork steaks, and so on; they can manage to live very well.

Mr. George William Bevan.

8301. (*Mr. Holland.*) Does not that seem to point out a great difference between the two diseases, that one disease can be suspended for many years commonly, and that the other can be suspended for years only very uncommonly?—There are cases, but with the miners they have not got that support to sustain life in the same way that another person might have under the same circumstances.

8302. You allude to their food?—Yes.

(A. c.) Foo the Miners.

8303. Are the miners, speaking of them as a class, a poorer class of men than the ordinary labourers?—Yes, generally speaking, they are; they marry early, and involve themselves.

8313. (*Mr. St. Aubyn.*) As a general rule, does the miner live as well as the common agricultural labourer, or better or worse?—I think he does. I think it is much the same.

8314. Does not the miner live rather better?—No, not from what I have seen among the agriculturists and among the miners. I think that they live nearly the same.

Mr. Philip Vincent.

10,476. (*Chairman.*) On the other days do you think that they have sufficient food, considering the work which they have to do in the mines?—I think it would be better if they had more beef or more meat.

(d.)—HABITS OF THE MINERS.

(A. d.) Ha of the Mi

Mr. Andrew Kingston.

3297 (*Chairman.*) Are the liver and stomach affected in the first instance?—Very little. We are not troubled with affections of the stomach or liver with the miners. They are a very temperate class of men, so that we do not get any affections of the liver from drink. There is very seldom anything of that sort.

Capt. John Webb.

5442. (*Mr. Kendall.*) Do you think that agents and men are as careless now as they were 20 years ago in those mines?—Yes, I do not see much difference.

Capt. Richard James.

8405. (*Chairman.*) Under Mr. Higgs's management, do you think that they are a better conducted class of men?—Yes, I am sure that they are.

Capt. William Rutter.

10,151. (*Chairman.*) Is it not an inducement to go to the alehouse?—Not much; we have very little to complain of in that way in this county.

10,152. The men are very temperate?—Very, indeed You can see that by the houses which you see studded about; ocular demonstration is best.

(B.)—MODE OF ACCESS AND EGRESS.

(B.) Mode of Access and Egress.

Mr. John Pearce.

4077 (*Chairman.*) Then it would be very desirable, would it not, to have a changing house as near to the footway as possible?—Yes; but I think that the great thing that would obviate that state of perspiration would be some means to enable them to come up more easily. I believe that that is the great thing the miner wants; it is not necessary in very shallow mines.

Capt. Thomas Trahair.

6904 (*Chairman.*) Do you think that men having that means of going down can work below at a greater age?—Yes, certainly, it is a great benefit to the men.

6905. Do you think that it is a benefit for you to employ old and experienced men in working?—Certainly.

6906. Than the means of ascending and descending enables you to have more experienced men?—Yes, it does; and not only that, but we can get more labour out of every man by his riding up and down. We perhaps calculate two or three holes for a man to bore in a day. I think it is better for a man to ride up and down by the skip, and it will not harm him so much as if he put in an extra hole every day of his life. A man's walking fast in the footways is very injurious.

Mr. Henry Boyns.

7393. (*Mr. Holland.*) How are the men drawn up in your mine; in waggons?—Yes. We have a railroad and a carriage to take the men up, but without a break; it is drawn up by a chain; we do not think it safe, and the men do it at their own option; we do not warrant it; we cannot do that without having a break to the wheel.

(B.) Mode of Access and Egress.

7414. (*Mr. St. Aubyn.*) But they use it without?—Yes, they do, but they do it at their own risk.

7415. But how can you feel justified in allowing the men so to come up if you do not consider it safe?—We say to the men, "If you do it, you do it at your own risk;" that is how we justify ourselves.

7416. But still the miners are under your control?—We consider that we are no longer responsible.

Mr. Robert Hart Pike.

9165. (*Chairman.*) Is there anything which you could suggest to the Commissioners as likely to tend to improve the condition of the miner?—I am not a practical miner myself, but having a large connexion with mining, and having heard the opinions of many of our best mining men expressed, the greatest improvements would be in introducing facilities for the men getting up and down without the fatigue of ladders.

Mr. Thomas Morris.

18,703. (*Chairman.*) How do the men ascend and descend?—By ladders. Our working has been very small comparatively at the 212 fathoms; in fact we have

(B.)—MODE OF ACCESS AND EGRESS.

Mode of

had no ore from the 140 fathoms down to the 212 fathoms, but now we fancy that we are riding on a course of ore at the 212 fathoms, and therefore we are now resuming our operations there by sinking the shaft, driving the levels, and putting down a winze.

11,704 At the 140 fathoms, therefore, are your principal workings?—At this shaft, from the 60 to the 140 fathoms

11,705. Is the power chiefly water power?—Yes; pumping by water power and hauling by steam; four steam engines.

18,706 In hauling do you use a wire rope?—Yes, and steel for some. We have only lately introduced it, and we find that it answers very well.

18,737. Do the men ever go down by the kibbles?—Not that we are aware of; that would be a fine.

18,708. Do you use the skip or the kibble in hauling?—Both.

18,709. Then it is by an incline?—By a railway and guides.

Ladders.

(*a.*)—LADDERS.

Mr. James Seccombe.

1352. (*Chairman.*) Do the men, when they come to surface, appear exhausted by their exertion?—Yes, sometimes, if they hurry up.

Mr. James Nance.

2646. (*Mr. Holland.*) About what time?—Perhaps half-an-hour sometimes, and sometimes three-quarters of an hour. They bore so much ground, and perhaps sometimes it is not quite so hard, and it is done more quickly at one time than at another. While in a state of perspiration they get in a draughty place, and stop there till the bell rings in order to prevent any collision with the agent, and there they contract their consumptive habits; I believe that to be the chief cause of the miners' complaint.

2647. (*Chairman.*) Do they ever stand waiting on the ladders before coming up, because if they came out before the time they would be fined?—There is no doubt they do; they stop in a draughty place; I believe that the miners' complaint generally begins with a cold, and that a succession of colds produces it.

A Miner, No. 1.

2831. (*Mr. Austin Bruce.*) When you had 260 fathoms to climb, how long did it take you?—About an hour and a half.

2832. Which was the hardest, that hour and a half or an hour and a half working?—The hour and a half climbing.

2833. Do you think that it took out of you as much as two hours of work?—Yes, as much as all the four of working, I should think.

2834. Did you work fewer hours in consequence of the length that you had to climb?—No.

2835. Your time was for eight hours all the time, was it?—Yes, we were obliged to work eight hours to get a living for our families.

2836 Did that tell upon your health?—No, I cannot say that it did.

2837. You were working in a healthy place there?—Yes, we were working in better air there.

2838. If you had had that climbing over and above a bad close end, what would have been the consequence?—I should not have been able to do it at all; you feel it in your legs directly.

2839 Do you think that you could do the same day's work in eight hours when you had to climb 260 fathoms by a ladder?—Yes, we always do the same work.

2840. (*Mr. Holland.*) In fact you were working 10 hours?—Yes.

2841. (*Chairman.*) Do you think that you were as well able to do the work?—No, I do not think that I was so well able to do it at all.

2842. (*Mr. Austin Bruce.*) After doing that day's work, and climbing 260 fathoms, were you ever so tired as not to be able to sleep or to be thrown off your food?—Yes, many a time; I carried my parcel underground, and brought it home as I carried it, scores of times.

2843. And did you find others the same?—Yes.

2844. You think that a man has a chance of a longer life who works in a pit where there is a man-engine?—Yes, if it be a deep one.

2845. What do you think is the amount of climbing which a man can do over and above his work without injury to his health?—About 40 or 50 fathoms we do not take much account of, but if we be working in bad air we then feel it; when we climb 10 fathoms we feel it in our legs directly.

(B. *a*) *Ladders.*

2846. (*Chairman.*) But in good air, what depth could you climb without injury to your health?—In good air we do not take any notice of it.

2847. Fifty fathoms?—Fifty or 60 fathoms.

2848. Would climbing 200 fathoms be fatiguing, even if the air was good; would you suffer from it?—It would be a little fatiguing.

A Miner, No. 2.

2906. (*Mr. Austin Bruce.*) As much as a quarter of a day's work?—Yes, I should think so. It would do more injury than a quarter of a day's work; and in these mines here if a person is working at 140 or 150 fathoms, and is working very hard ground, generally speaking, we have to carry all our tools, and sometimes we have a very heavy sling, perhaps 40 or 50 lbs. weight, upon our shoulders, to carry that distance.

A Miner, No. 3.

2939. (*Chairman.*) Have you ever climbed any great depth of ladders?—No, not lately; not the last ten or dozen years.

2940. (*Mr. A. Bruce.*) What was the greatest height which you had to climb?—230 fathoms.

2941. By a ladder?—Yes.

2942. How long did that take you?—I am sure I do not know, it would take an hour or an hour and a half, I suppose, if you went along smart.

2943. An hour and a half coming up?—Yes, I suppose so.

2944. And how much going down?—Three-quarters of an hour, perhaps, or just like that; I cannot tell exactly to a quarter of an hour.

2945. Is an hour of climbing as bad as two hours of work?—Yes, worse, I think, that is in an upright shaft; a great many shafts in this country are underlay, and that is not such hard work as when it is upright.

A Miner, No. 5.

3107. (*Mr. A Bruce.*) Only in the deep ones?—Only in the deep ones, and in some a good deal of trouble would be required to put a man-engine. In the Phœnix mine, for instance, it might be a good deal of trouble, because in one shaft it is downright and on the lay, and in the other it is downright. In some mines again the footways are put in the same shaft where they wem all the stuff, making it very dangerous for a man to pass up and down.

Mr. Christopher Childs.

3128. (*Chairman.*) Ladder climbing not being, in your opinion, injurious in itself, if a man had been working in bad air, and then had to climb, would it not be injurious?—I believe that it would be most injurious. I hear of no disease among the agents incident to that ladder climbing, and I think that, as a whole, if there has not been disease before they have become agents by working in foul air as miners, a more healthy body of men you cannot find anywhere than they are. I arrive at the conclusion from that fact, that ladder climbing is not productive of disease. I admit that it aggravates disease very seriously in a diseased man.

Mr. Andrew Kingston.

3288. (*Chairman.*) You have alluded to climbing; what is the effect upon the miners of climbing?—The act of climbing first of all produces a very violent action of the heart. Then they have to breathe more hurriedly, and I believe that they get what is termed emphysema of the lungs, which I can explain. (*The witness made a sketch.*) Supposing that to be a bronchial tube, and these to be air cells influenced by the violent breathing of bad air for a series of years, these air cells, instead of being very small indeed, become large, so that the lungs are always full of air, but yet they do not get a proper quantity of fresh air. We have a number of men in the mines from one time to another who come to us, and they are failing, and they look as if they were consumptive, and we examine them, and cannot find any trace of consumption at all. We

(B.)—MODE OF ACCESS AND EGRESS.

3 a.) *Ladders.* strike them on the chest, and their chest is much more resonant than it should be, and I believe that it is owing to this emphysematous condition. We have had several such men from time to time, and there are some about now, I think. They cannot make any exertion. They are well up in flesh, and some of them look the picture of health, but they cannot work at all, and they are home for months and months. Then these cases often terminate in consumption

3365. (*Mr. A. Bruce.*) Do you mean that the ventilation in most cases is so positively good as that a man may continue to work in it without bad effects to his health?—I was once under ground, and I know that the climbing hurt me a good deal. I climbed 100 fathoms, and was very glad to sit down every 10 fathoms; it made my heart beat so violently, that it almost jumped out of my side.

3366 Do you consider the greater part of the bad health, which you have described as being almost universal among the mining population, as compared with the agricultural population, to be the effect of bad ventilation, or of fatigue arising from mounting ladders?—I believe that both combined have an influence; but I think that the climbing a long distance has a very prejudicial effect. The heart beats so violently, that the blood is thrown in upon the lungs, and you are obliged to breathe much more rapidly; and a long continuance of that, year after year, acts very prejudicially.

Mr. Robert Dunstan.

3448. (*Mr. Austin Bruce.*) What is there in the nature of their employment that makes the difference?—Climbing particularly.

3450 In your opinion, can the climbing be got rid of?—It is got rid of in some instances.

3451. Could it, do you think, be got rid of in more instances?—Yes.

3452 To what extent do you think it could be got rid of?—We consider that in an established mine, the man-engine should be employed for lifting the miners up.

3453. Have you ever thought of any other plan than that of the man-engine, and which would be more convenient?—Yes; but I do not think that any other plan would be applicable in Cornwall.

3454. Do you think that a man-engine would be too expensive for small mines?—I think not. I think that a man-engine could be employed very inexpensively

3455 What do you mean by the terms "an established mine"?—I mean where a mine has been discovered to contain minerals of sufficient quantity to admit of its being worked to any extent There are many mines that are very ephemeral.

3456 In all such cases, you think that a man-engine might be employed?—I think it should be employed

3457. In your opinion, that would get rid of a great deal of the sufferings of the miners?—Yes; the climbing is the great bane of the miner

3594 (*Mr. St Aubyn.*) You stated at the beginning of your evidence that the climbing up of ladders was one of the principal causes of the bad health of the miners?—That is the great cause. I have known men in West Cornwall who died on the ladders. They have come up to the top of the ladder, and then dropped down dead suddenly from disease of the heart brought on by climbing.

3595 In your opinion would the adoption of a man-engine, wherever it was practicable, entirely prevent that one cause of illness?—From that particular source.

3633. (*Chairman.*) When there is only one shaft, it is divided between that and the kibbles, is it not?—Yes, and then there is an engine working up and down which makes it dangerous for the men to travel through. All mines should have a private footway apart from all the engines.

3634. So that if any obstruction happened in that one shaft the men would have a way to retreat?—Yes.

3635. Are the shafts lined with wood?—Yes; but some of the footways in them are very bad The kibbles falling away knock away the casing, and make large holes, which render it very dangerous.

3636 That is, if any material were to fall down and break through the division, it might endanger life?—Yes; many men have been killed by it.

3637. Is there any security that the ladders are in good condition?—Sometimes the ladders are injured by the falling away of the kibbles. (B. a.) *L*

3638 Is there any periodical inspection of the ladders?—Not that I know of

3639. All the bars are made of iron, are they not?—No; they are made of wood.

3640. If made of wood, are they not liable to rot and to break?—Yes; they wear very thin, and then break

3641. Then, of course, that is very dangerous for the men?—Yes, of course it is, and men fall off the ladders sometimes.

3642. How does that happen?—We can hardly tell that Perhaps one or two of the staves are broken, and a man coming down, and not holding on by the stave above, has a sudden jerk and goes away.

3643. Do you not think that there should be better security, and that the means by which the men go down or come up should be improved?—I think that the footways are very often neglected.

3644. (*Mr. St. Aubyn.*) Is it not the business of the underground captain to look after the ladders?—Yes, it is; but when you have only one shaft for the engine-cradle and the kibble, there is not sufficient room very often to make it a good and a safe footway.

3645. (*Chairman.*) You would recommend in any mine that there should always be a separate footway?—Yes, there should be a separate footway, a mine is not safe without it.

3646. Do you suppose that many of the shafts and footways in the mines of this county are in bad condition?—I know that some are.

3647. And those ought to be specially inspected?—Yes, they ought to be inspected.

3648–78 Do you think it is desirable that the Commissioners should inquire into that point?—I do not know the object of the Commission exactly, but it is for the safety of the men that it should be inquired into.

Mr. William Wale Tayler.

3811. (*Mr. Kendall.*) Take the ventilation of the mines *per se* on one side, and take on the other side the act of climbing, the want of privies at home, the fact of the men sometimes having bad changing houses, and being exposed to cold and other want of accommodation, and perhaps in some cases not having quite food enough, which do you think is the most injurious to the miners, the ventilation or the other matters?—The climbing, I think, is the most injurious.

3812 Do you think that the illness which arises from imperfect ventilation is a small item as compared with the others, as far as you know and have heard?—Yes, as far as my experience goes, because there have not been great complaints made about ventilation. There may have been complaints, but not great complaints.

3813 I want to draw two lines: I take ventilation as one, and I take as the other the climbing, the want of proper changing houses when the men come above, the want of care on their own part, and the want of privies and free air at home—which do you think does most damage to the miners?—The climbing and the other things which you have connected with it, decidedly

Mr John Pearce.

4106. (*Mr. Kendall.*) You have laid great stress upon the men climbing up the ladders, and you seem to think that a great deal of danger arises from their climbing so much as they do?—Yes, decidedly.

Mr. William Petherick.

5568 (*Mr Kendall.*) The man-engine had not been introduced there when you came away?—No. I recollect going up from 140 fathoms deep, and when I got within 50 fathoms of the surface I would as soon lie down and remain there as go up, I was so exhausted, that principally arose from the inclined state of the ladders; they were inclined in that way that the weight rested upon the chest and head.

5569. Although you have constantly ascended and descended a mine, still you never ascended without feeling considerable fatigue after mounting a certain number of fathoms?—Always great fatigue; it was so at 100 fathoms.

5570. And that would increase as the mine became deeper?—Yes.

(B.)—MODE OF ACCESS AND EGRESS.

Capt. Silas James.

Ladders.

5994. (*Chairman.*) Which is the footway?—There is one footway for the Western mine, and up the other engine shaft is the footway for the Eastern mine.

5996 There is no protection between the footway and the pumping shaft?—No.

5997. Have you never had any accident there?—No.

5998. Do you not think that there ought to be some protection between the pumping shaft and the footway?—If there was, nothing would stop an accident, if the beam was to break there must be a pretty protection to stop it. We put rails on the ladders to keep everyone safe.

5999. For the protection of the men should there not be some protection between the ladders and the shaft?—We have rails at the bottom and top of every ladder,

6000. But none at the side?—No.

Capt. Richard Boyns.

6703. (*Chairman.*) What is the distance between the staves of the ladders, are they 10 or 12 inches?—Principally a foot; in this last year or two we have introduced some 10-inch distances The miners do not like the short distances.

Capt. Thomas Trahair.

6906. (*Chairman*) Then the means of ascending and descending enables you to have more experienced men?—Yes, it does; and not only that, but we can get more labour out of every man by his riding up and down. We perhaps calculate two or three holes for a man to bore in a day. I think it is better for a man to ride up and down by the skip, and it will not harm him so much as if he put in an extra hole every day of his life A man's walking fast in the footways is very injurious.

6907. How long does it take him to come up the ladder?—It ought to take from three quarters of an hour to an hour, but some of them come up in twenty five minutes.

6908 You think that they injure themselves by coming up quickly?—Yes, just as much by walking fast in the footways as in damp ends. Very often when they are out the young men walk together, and one will not give way to another.

Mr. Henry Boyns.

7343. (*Chairman.*) After leaving a close end, do you feel affected when you are climbing the ladders?—I do not think it makes much difference in that respect; if a man works hard he becomes exhausted, but the climbing, I believe, is an evil amongst us. I think that we climb rather to fast, generally speaking.

7344 What causes do you think chiefly interfere with the miners' health?—The first cause no doubt is the closeness of the air. The next is climbing the ladders, that has proved very injurious to our young men in walking up so fast, which they often do, the heart is greatly affected. I was down 200 fathoms yesterday, and I found that I could climb the ladders very comfortably, and felt very little exhausted when I got to the surface after doing my work of examining the mine. The third cause is the high state of perspiration produced, and then coming into a cold atmosphere near the Atlantic, and then, perhaps, having miles to walk to their homes.

Capt. Richard James.

8353. (*Chairman.*) Are the bars of the ladders 10 or 12 inches apart?—They are 11 inches apart with us, but they vary very much. We do not see many ladders now 12 inches apart; those are the old style.

Capt. Thomas Richards.

8893. (*Chairman.*) Although the time should be shorter, would it not be an advantage for the adventurers, on account of the greater amount of work the men could get through from ascending and descending by a man-engine?—There are so many causes that are injurious; for instance, from climbing; men are so differently constituted that some men will climb well until they become old men, and yet some of those men are done up in a week; that climbing is very objectionable there is no question.

Capt. Joseph Vivian, North Roskear.

(B. a.) Ladders.

9111. (*Mr. St. Aubyn.*) Supposing that you could spare a shaft to adopt a man-engine, how deep would you go before you thought it necessary to give up the footways?—I should not trouble myself about a man-engine if the mine were only 130 fathoms deep, if the ladders were well arranged; sometimes they are not well arranged, they are too perpendicular or too flat. A proper pitman will know exactly how to arrange the ladder.

Mr. John Cady and Capt. Pascoe.

9831. (*Mr. Holland.*) Can men of 30 generally climb as much as 100 fathoms without suffering distress?—No, they cannot.

9832. Could they climb as much as 50 fathoms at that age without suffering distress?—No; they would require a stopping place.

Capt. William Rutter.

10,210. (*Mr. St. Aubyn.*) Do you consider a man-engine advantageous where it can be used?—Most certainly. I will give you a case. In Great Alfred, when Mr. Field was the principal, they came down, and put that mine to work. Some years ago he asked my opinion, because I had worked in the mine before. Mr. Field asked me what I thought about working the Great Alfred. I told him, "If you put up a man-"engine, and put a machine to raise the miners, you "may succeed, but I would not give a farthing for it "else." For men to come up 300 fathoms, it being very hot down there, is a tolerably tidy day's work, with nothing else.

Mr. Thomas Hutchinson.

10,591. (*Chairman.*) Have you any suggestions to make by which the causes from which miners suffer by working underground might be modified?—If the climbing up the ladders could be done away with, it would be very advantageous; they evidently suffer from climbing, from want of ventilation, from the powder smoke, and the dust. If the levels could be made wide, these and the ends better ventilated, and the climbing done away with, the condition of the miners would be much improved

Capt. William Chappell.

10,763. (*Chairman*) Do the men ascend and descend there by ladder?—Yes; we have 10 inch staves; the former plan was 12 inch. We now find the other much easier, and the last few years we have taken out all the old ones, and put in what we call 10 inch staves; the men travel a great deal easier.

Mr. Thomas Gill.

11,059. (*Chairman.*) Why have you not in your mine a man-engine or any improved means of taking the men up and down?—Our mine is a young mine yet: we have only got it down to 162 fathoms, and that is no great depth.

11,060. Is it not a great depth for the men to climb?—No

11,061. To what depth would the shaft be carried before you would recommend some improved means for raising the men up?—I should say about 150 or 160 fathoms, if you have a convenient shaft to put it in. We are sinking a sumpt, and we shall have it down to 132 fathoms in the course of two or three months more We were thinking to increase the area of the old shaft down so far as the 132 to bring up the men.

11,062 How would you bring them up?—Just the same as the man-engines that have been set up in Cornwall; we can apply stages on the same rod.

Capt. John Hancock and Mr. Michael Morcom.

11,196. (*Chairman.*) Do you know the distance which the steps are apart?—12 inches.

Capt. Zacharias Williams.

11,805. (*Chairman.*) What is the distance between the staves of the ladders?—12 inches.

(B.)—MODE OF ACCESS AND EGRESS.

(B. a.) *Ladders.*

Mr. Thomas Morris, Devon Great Consols Mine.

18,723 (*Mr. Kendall.*) You have given the matter a great deal of consideration; at what period, generally speaking, of a mine's depth do you think it wise to begin to use a man-engine?—I should say from the 150 fathoms to the 200 fathoms. Much depends upon the nature of the men that you employ; we want a large quantity of work done in these mines, and our men are chiefly young men; young men, of course, are more able to climb the ladders than middle aged men would be.

18,724. Your mine has been established some time, in 1844; if you started with young men you must after a while have a fair share of aged men?—Yes, we have some old men; but if we take on any fresh men we generally contrive to have young men.

18,725. Your impression is that on the whole it would be cheaper and better to work a mine till it is 150 fathoms deep before having a man-engine?—Yes; I should not think it necessary before arriving at that depth

18,732. (*Mr. Holland.*) Am I to understand you that when your men get above 30 they find the climbing too hard for them?—No, I should say not; but still our work is hard; we require them to keep constantly at it, and therefore we select young men as a general rule.

Mr. William Hosking, West Beam Mine.

19,268. (*Chairman.*) Are the footways in the drawing shaft or are they separate?—The principal footways are in the drawing shaft.

19,269. Are they bratticed off?—Yes, we have put in a new footway all the way from the surface to the bottom, in one shaft, very recently. We have new timbered the shaft all the way from the surface and we have got in a new footway all the way.

19,365. (*Mr Kendall.*) From your experience, what do you think, is the most injurious part of the miner's occupation; is it climbing, is it smoke, or is it chill when they come up?—Climbing deep and bad air; a man has no business to be chill when he comes up, he should take it leisurely and change directly.

19,366. But they do not do that?—But that is their own fault. I think that climbing very deep is very injurious to the constitution.

Mr Joseph Phillips Nicholls, Frank Mills and South Exmouth Mines.

19,476. (*Chairman.*) Are the footways in the drawing shaft?—The principal part of the men come through the engine shaft and drawing shaft, but they are divided.

19,477. They are bratticed off?—Yes. There are three shafts, and in case of accident they could come through any one

19,521. (*Mr. Kendall.*) Did you catch cold underground?—No; I got wet above ground,

19,522 Wholly unconnected with mining?—Yes. My health is as good as any person's.

19,523. Have you warked in the deep mines in Cornwall at all?—Yes.

19,524. In what mines?—In the Great Consols; I have worked as deep as the 240 fathoms.

19,525. Did you go down by a man-engine or by ladder?—A ladder.

19,526. How long did it take you to go down?—About 20 minutes to go down.

19,527. And how long to come up?—Three quarters of an hour to an hour.

19,528. You had no man-engine in those days?—No.

19,529. How many hours used you to work underground clear?—It was called eight hours, but then we made the up and down in the eight hours.

(B. b.) *Man-Engine.*

(*b.*)—MAN-ENGINE.

A Miner.

2907. (*Chairman.*) I suppose that if means were provided for ascending you would be very glad to adopt them?—Yes, quite so.

2908 You would not prefer the ladders?—I never saw any man-engins, but I have heard individuals speak of it who have been accustomed to ride up and down, and they say that it is a very great benefit in deep mines.

Mr. William Wale Tayler.

(B. b.) *Man Engine.*

3844. (*Mr. F. Egerton.*) I understood you to say that you thought that the health of the miners had much improved during the last few years?—Very greatly.

3845. You attribute that, I think, to the use of the man engine?—Principally to the use of the man-engine.

Mr. John Pearce.

4107. (*Mr. Kendall.*) Since the introduction of man-engines, do you think that the danger has been diminished?—Yes; and I have no doubt that it will be observed in the neighbourhood of St. Blazey that diseases of the chest will be much less in the next 20 years than they have been in the past 20 years.

Mr. William Pace.

4261. (*Chairman.*) How long has the man-engine been employed?—About eight or nine years.

4262. At which mine is that?—At Fowey Consols.

4263. Is there a man-engine at the other mines?—Yes, there is at Par Consols.

4264. How long has it been there?—Only a short period.

4265. Do you know how long it has been there?—Within the last year and a half.

Mr. Richard H. Williams.

4335. (*Chairman.*) Are you acquainted with the man-engine sufficiently to say whether any accidents have happened?—No accident has happened at Par Consols or at Fowey Consols, I think, to either of them; but on its first introduction it was rather dangerous; they had two rods working side by side, so that a man stepped from one moving rod to the other; but at Fowey Consols you step off on to a platform which is fixed, and your attention is called only to one object instead of to two. I have come up by that with very great ease

4336. Do you think that the man-engine can be applied to all mines?—I think that to all deep mines it should be applied, but in shallow mines it would be a question of very great expense. The operations of mineral mining are peculiar; it sometimes occurs at the first onset of a mine that all the establishment, the plant, &c., is erected on one spot, and after some time the most productive ground is found to be perhaps three-quarters of a mile away, and the works would have to be reconstructed. I think therefore that a mine should be established before a man-engine is resorted to.

Mr. Francis Barratt.

4538. (*Mr. F. Egerton.*) Are you of opinion that the man-engine is an economical mode of working a mine?—Yes.

4539. Is it more economical than the ladders?—Yes. in a very deep mine, where there are a great number of men.

4540. At what depth do you think it advisable to put down a man-engine, or can you speak with certainty upon that point?—When we go down below 100 fathoms.

4541. I suppose the principal saving is the saving of time?—Yes, and the men's health.

4548. (*Mr. Holland.*) You say that you would prefer the man-engine to the skip; is that because you think it safer?—Yes.

4549. Is that the only reason?—We do not use wire ropes in this neighbourhood.

4550. If your objection to them was removed then your objection to the skips would be removed?—I think I should prefer the man engine.

4551. For what reason?—I fancy that it is safer.

4552. But should you prefer it for that reason only?—Yes.

4553. If it were proved to you that the other was equally safe, would you then have any objection to it?—Yes.

Mr. Richard Quiller Couch.

6453. (*Chairman.*) Do you think that that would tend to diminish their weight?—I find that in a case where there is a man-engine, at Wheal Reeth, the boys actually now get out of the man-engine and climb up between the lifts in order to give themselves a little exercise.

(B.)—MODE OF ACCESS AND EGRESS.

(B. b.) *Man Engine.*

6486. (*Mr. St Aubyn.*) Do you not think that any system by which climbing from great depths could be avoided would materially improve the condition of the miners?—Yes; and I may mention a case that occurred only a day or two since. A man was working in Wheal Reeth in a very close end, and disease of the chest was coming on. He went to work and was put in another place where he was lifted by a man-engine and he recovered, I should think, in less than a third of the time that other men labouring under the same disease would have recovered in. They were ascending to another shaft. I find that continually the case where the man-engine is employed, the men do not suffer so much, and they recover more quickly than they do when they have ladders to ascend.

Capt. William Stevens.

8107. (*Chairman.*) In what manner do the men ascend in your mine?—We have a man-engine.

8108. Is it a single or a double man-engine?—Single.

8112. They come from the distant parts of the mine below ground to come up by the man-engine?—Yes.

8113. Are you able by having the man-engine to employ older men than you would otherwise?—Yes; very much indeed.

8115. Do you think that an advantage?—Yes; very much so.

8116. You would sooner have an experienced miner than a young hand?—Yes; we would rather have one older man than we would have three of the young ones.

8117. What would you call a young man?—Before we had the man-engine there, we could not get men above 20 years of age to go down to the bottom of our mine.

8118. And now of what age are the oldest men?—Sixty.

8120. Can you state any other way in which it has been an advantage to the adventurers; do you get more work from the men?—Very much. Before we had a man-engine perhaps we were obliged to give 12*l.* a fathom for ground, and we have got it now worked for 9*l.*

8123. (*Mr. Holland.*) And three men now do the work of four?—Yes.

8186. What do you estimate to be the average saving of labour by the use of the man-engine?—About one quarter.

8187. In the shallower levels it will not be so much, I presume?—Yes, they will not climb the ladders at all.

8188 But those men who only go down to the shallower levels are not saved so much as those who descend to the deeper levels?—Yes; they go to the man-engine, they will not climb the ladders.

8189. What is your estimate of the average saving, taking into account the whole of the men, those who go to the deepest levels, and to whom most is saved, and those who go the shallower ones, and to whom less is saved, is it as much as a quarter?—Yes.

8190. About how much does a man-engine cost?—About 2,000*l.*

8191. Is it a very profitable investment?—Yes.

Capt. Charles Thomas.

8655. (*Chairman.*) At the Dolcoath mine, what is the depth of the lowest shaft that you are working at?—From the surface it is just exactly 300 fathoms.

8656. What means are employed at that mine to enable the miners to ascend and descend?—We have a man-engine to send down the men by and pull them up again, down to 220 fathoms out of the 300.

8657. Is it a single or a double man-engine?—Single.

8659. Which of the two do you prefer?—I much prefer the single one as being safer,

8660. By the double man-engine can more men be sent down?—Yes; but not in proportion, not double as many in the same time.

8674. What would be the extreme distance from the farthest level at Stray Park to the man-engine at Dolcoath?—250 fathoms.

8675. Would the men rather walk that distance than go up the ladders?—Yes; some of our men in Dolcoath walk as far as that.

Capt. Thomas Richards.

(B. b.) *Man Engine.*

8894. (*Chairman.*) Do you think that where a man-engine is used men of greater age can go down to work in a mine than where ladders are employed?—Yes; and then you have the advantage of their experience

8895. Is it not an advantage to have experienced men employed in mines?—Quite so; it is a kind of work that time only makes a man suitable for.

8896. Therefore any means by which you could ensure the employment of experienced men in the mines would to a certain extent be an advantage in a pecuniary point of view to the adventurers?—There is no question that men of experience are better in any places, whether underground or upon the surface.

8990. (*Mr. Kendall.*) At what depth do you think that a man-engine begins to pay well?—You must go back again That depends upon the state of your finances, and the position of the mine; but I do not think there is any value in it until you get 100 fathoms below the adit.

Capt. Joseph Vivian, North Roskear.

9109. (*Mr. St Aubyn.*) Are you of opinion that where it is possible and convenient to introduce a man-engine it is conducive to the health of the miners?—I should always have a man-engine if it could be had conveniently, but in some places you cannot have it.

9110. The convenience or the possibility of adopting a man-engine depends in a great measure upon the paying of the mine, does it not?—Yes, upon circumstances; you may have a shaft that you can part with in old mines which have been worked a long time. They frequently have a shaft that they can part with if they have the means of putting up an engine and having everything complete; then it is done: but in other cases, where you work hard and cannot make the two ends meet, and have not a shaft to part with, it cannot be done; the very thing itself would sack the mine.

9111. Supposing that you could spare a shaft to adopt a man-engine, how deep would you go before you thought it necessary to give up the footways?—I should not trouble myself about a man-engine if the mine were only 130 fathoms deep, if the ladders were well arranged; sometimes they are not well arranged, they are too perpendicular or too flat. A proper pitman will know exactly how to arrange the ladder so as to keep the whole human frame in a proper position.

Capt. John Daw.

9226. (*Chairman.*) Are there any means there for the men to come up and down, besides ladders?—We have a man-engine in Carn Brea for the men from the 105 fathoms below the adit. We now take them from the 105 fathoms below the adit, which is about 137 fathoms, and in 15 or 18 months I suppose we shall take them from the 154 fathoms.

9230. In what way?—With the man-engine the men are obliged to stay down there for a number of hours; they are lowered by the engine down to the 105 fathoms, and then the engine does not go to work until about ten minutes or a quarter of an hour before their time is up, and therefore we have the advantage of the men's labour.

9231. (*Mr. Holland.*) How much more have you?—I think that we have about 15 per cent. more.

9232. (*Chairman.*) Do the men prefer waiting for the man-engine to attempting to climb the ladders?—They do. They would rather stay down two hours than they would climb up from the bottom of the mine. Last week some of the men were very much put out because we did not work the engine on the Saturday afternoon for them to come up. However, we did not know that they were down, if we had known we should have worked the engine. They complained of not having the engine to take them up.

9233. Do you think that you are able to have older men working in consequence of a man-engine?—Yes. We can send down a man who is able to work, and he will labour as well as if he had only been 20 fathoms below the surface.

9234. You therefore get more experienced men?—We do. That is the way in which we think that we have 15 per cent. more labour; in fact, for the first two months after we put up the engine to work we found that we broke about that quantity of stuff more.

(B.)—MODE OF ACCESS AND EGRESS.

(B. b.) Man Engine.

Capt. William Teague.

9353. (*Chairman.*) Have you ever thought of putting in a man-engine?—Yes, we have thought of it several times.

9354. Do you think that it would be desirable to have some such means for the men to ascend and descend?—Yes, very desirable.

9365. Have you ever had the cost of putting up a man-engine estimated?—We have thought it over; we thought that it would be from 1,500*l.* to 2,000*l.*

Mr. John Richards.

9436. (*Chairman.*) In what manner do the men ascend and descend the shaft?—By a man-engine; sometimes they go down by ladders; but they can always come up where the man-engine is; that is as far as the Clifford United mines are concerned; but at the Consols we have a shaft 120 fathoms deep, and they go down and come up there by ladders.

9439. How long has the man-engine been working?—I should think from 18 to 20 years

9440. Is it a double engine?—Yes. It has been working 18 years

9599. Has any accident ever occurred with the man-engine?—Yes, once.

9600. How did it occur?—The man missed the stope.

9601. Do you think there is no danger if the iron handles by which they hold on are off?—There ought to be none off

9602. How could a man hold on without them?—He has to keep his hand on the side of the rod; the iron handles are off but very seldom.

9603. But if they are off, do you think there is no danger in it?—Not with people who are used to it.

9604. Do you think it is safe to hold on only by the rod?—Yes.

9605. Do you not think that for the safe working of a mine, it is desirable to have one man employed in inspecting the whole of the work, and to see that every one thing is in good working order?—To be sure.

9606. Do you employ one man for that purpose?—We have one inspector there to look after all the machinery in the mine.

9607. And also the footways?—Yes.

9608. (*Mr. Kendall.*) Should you not consider that what was perfect safety for the miner would be rather dangerous for a perfect stranger?—To be sure.

9609. The Chairman asked you just now about the danger in the different levels in consequence of the winzes not being covered over. You often leave them open, do you not, with a small plank placed across?—Yes.

9610. If a plank six or eight inches wide were placed over a winze 50 feet deep, you would call that perfectly safe, would you not?—Yes, I should say so.

9611. You would give a stranger a helping hand?—Yes, we should be very cautious with them, and show them a light

9612. If you were to cover over those winzes in order to accommodate a stranger, would not that a good deal interfere with the ventilation?—Yes, very materially.

9613. Do you think that a miner has to crawl across a plank of that kind, when his candle accidentally goes out, twice a year?—Not across a winze.

9614. Do you think he crawls anywhere twice a year, if his candle happens to go out?—Perhaps he does

9615. Ought a miner ever to be without a light?—No.

9616. I suppose that for a halfpenny a year spent in lucifer matches, he could get light enough to guard against everything?—Yes, the miners are not allowed to be without a light; if they are, it is their own fault.

Mr. Joseph Jewell.

9702. (*Mr. St. Aubyn.*) You have no doubt as to the man-engine being a better thing than footways, where it can be conveniently introduced?—I think it is most essential for the well being of mankind. I did belong to the mine where Mr. Richards is, where a man-engine was put up, and I found it very good.

9703. You have a preference for the man-engine, as compared with a skip?—Yes, I prefer a man-engine to a skip myself.

9704. Do you consider that the health of the miners generally in this district is better than it was when you began mining?—I do think so; very much better.

Capt. Joseph Cock, St. Day United Mine.

10,048. (*Mr. Davey.*) Are the man-engines looked upon with favour by the miners?—I have no doubt that they are.

10,049. Would you erect one?—Yes, if I saw a proper place, and had the capital to do so. I have no objection to them.

10,050. But you do not think so much of the benefit of a man-engine as to put yourself out of the way to erect one?—In our mines, where they do not work more than two or three years standing, it is hardly worth while.

Capt. William Rutter.

10,211. (*Mr. St. Aubyn.*) How deep would you go in a mine before you began to use the man-engine?—I think the man-engine is of very little use before you are 100 or 150 fathoms deep, and then it is time to get it to work.

10,212. You think that a man, if he did not climb too fast, could come up 100 or 150 fathoms easily?—Yes.

Charles Fox, Esq.

10,528. (*Mr. Holland.*) That is, that it circulates in the mine, and not through it?—Yes; the great difficulty is as to the powder smoke. Then, with regard to the expenditure of muscular power, before the man-engine was introduced, I found in the Consolidated Mines, after multiplying the number of men by the depth from the surface of each level, and reducing the whole to unity, that it amounted to an ascent many times as great as that of the Himalayas.

10,529. Do you consider the man-engine of great importance and utility to the miners?—It saves their muscular labour, and the hurried action of the heart and lungs.

Capt. Thomas Gill.

11,063. (*Chairman.*) Do you think that that is a preferable mode to the skip?—Certainly.

11,064. (*Mr. Holland.*) On what rod would you apply the stages?—The rod that we have working in the shaft.

11,065. The pump rod?—Yes.

11,066. (*Chairman.*) Why do you not think the skip an available mode of bringing the men up?—I think it is more dangerous than coming up by the rod.

11,067. Have you ever seen a skip used for bringing up the men?—No, I never saw it used; but our men, at the time we were working the old mine at Wheal Vor, used to come up in the skip sometimes, as many as five together in the skip.

11,068. (*Mr. Holland.*) Did any accidents arise from its use?—Not one in the skip for drawing stones. I came up in it from the 284 one day.

11,069. (*Chairman.*) Was the skip drawn by a chain or a wire rope at Wheal Vor?—It was drawn up by a hempen rope.

11,070. What was the breadth of the rope?—It was seven inches wide and a chain attached to the end.

11,071. Were the men allowed to come up in that way?—No.

11,072. Was it a double skip or a single one?—It was a double one. I sent down three men there one night after they came up, so as to try to prevent them coming up that way.

11,073. You thought it too dangerous? Yes.

Capt. Zacharias Williams.

11,900. (*Mr. St. Aubyn.*) Have you ever thought of having a man-engine put into the mine?—I should like it very much myself, but I am sorry to say that the mine is so poor that it will not afford it.

11,901. If you could have a man-engine in the mine you would rather prefer it?—I should be glad to have it.

11,902. You would of course require steam power for it?—No; it might be done with water.

11,916. (*Mr. Kendall.*) You say that you wish there was a man-engine, but that you cannot afford it?—Yes, I should be very glad of it.

11,917. Do not you think that if you had put in a man-engine at the time when you could have afforded it the chances are that you would have been more successful in making discoveries and not so poor as you are at

(B b) Man engine.

present?—I do not know what difference that would have made in the poorness of the mine

11,918. If you had had greater facilities for sending the men down to the bottom you would have got more men to go down who would have been able to work your ends cheaper?—I do not think so, I do not see that at all

11,919. Would not the men have been able to do more work?—They would be there a longer time, and would be quicker down.

11,920. If they had been down a longer time, and if, therefore, they could have done more work, would not that have given them a better chance of making discoveries?—Possibly it might in the time, and it would be a saving to the adventurers, because the more work they do in the time the less price is required for doing it.

11,921-2. (*Mr. Davey.*) Although the not having a man-engine may save money to the adventurers, yet it would not prevent discoveries being made?—I hardly see that the advantage of it would be greater.

Mr. Thomas Morris, Devon Great Consols Mine.

18,743 (*Sir Philip Egerton.*) How many hours do the men work underground here?—Eight hours.

18,744 Does that include the time of going up and down?—Yes.

18,745 How long does it take your men to come up from the 212 fathoms level?—About half an hour up, less to go down

18,746 Say one hour in going up and down?—Yes.

18,747. Then you lose an hour's work as compared with a man-engine?—Yes, deducting the time a man-engine would occupy.

18,748 In addition to the time which you would gain, the powers of the men would be more husbanded by going down by a man engine?—Yes; there is no question that it would save a great deal

18,749. And your calculation is that for anything below 150 fathoms a man-engine would pay?—I should think it would, but I would prefer taking the advice of practical men.

Mr James Richards, Devon Great Consols Mine.

18,794. (*Chairman.*) And for that depth mechanical means are not required?—No. I do not think it necessary to have a man-engine there, where the ventilation is good.

(B c) Skip

(c.)—SKIP.

Mr. T. Trevillian, Herods Foot Mine.

1155. (*Chairman.*) Do you not think that it would be an advantage for the men to be conveyed up by some means, instead of having to climb?—We must admit that it is a great assistance, and a very comfortable passage, instead of climbing.

1156. Do you suppose that there is any difficulty or objection to carrying out properly these means?—There are great difficulties to contend with, if we go into the general question. We cannot put man-engines and shafts for every mine, just where people may imagine. They are plausible things to talk about, but difficulties will occur.

Mr. James Nance.

2671. (*Chairman.*) In your opinion could no other machine be adopted for the same purpose?—I think that there might be substituted for it what we call a gig, what we repair our shafts with. That might work in slides similar to skips. There is a canopy at the top, and it is square, with a door opening on one side, and it hangs on the top like a swivel, and you may turn it about as you like.

2672 (*Mr. A. Bruce.*) Could you use such a machine in a shaft which was not perpendicular?—Where a skip would work that would work, it could work on the same slides.

2673 (*Mr. Holland.*) Would it not work in any ordinary shaft?—Yes, any drawing shaft.

2674 (*Mr. A. Bruce.*) Would you work this machine in the same part of the shaft as that by which you bring up the ore?—Exactly the same part of the shaft.

2675. Could that be done without interfering with the delivery of the ore?—For the time that the men were going up and down they could not draw the stuff,

(B c) Skip.

2676. Would there be time enough for the delivery of the ore after allowing for the time taken up by the men?—In most mines the whole of the time is not fully occupied in drawing. If the shaft was not sufficient to discharge the stuff and the men, there could be another shaft to do it.

2677 (*Chairman.*) What would be the cost of one of those cages?—It could be made for about 15l.

2678. (*Mr. A. Bruce.*) The main expense would be the rope, would it not?—The same gear would do for both

2679. There would be a little more wear and tear of the gear, that would be all?—Yes

2680. (*Chairman.*) What should you say would be the cost of such a contrivance per day, for sending down 100 men; how much coal would it cost per day?—I should not think that it would exceed one shilling.

2681. (*Mr. A. Bruce.*) Have you ever seen that contrivance in use?—No, not in this country.

2682. Have you ever heard it recommended to any agent?—Yes, I have heard it recommended hundreds of times.

2683. Have you ever heard any good objections to it?—I have never heard any good objections to it.

2684. What objections have you heard to it?—The men, when it has been recommended to them, have said, "We would rather trust to the ladders;" but I believe that if the proprietors of the mines had entered heartily into it, it would have been done years ago; but they appeared to be rather indifferent to the matter.

2685. Then the objection came from the men, and the proprietors did not press the thing?—Yes.

2686 Have you ever known any change, however beneficial, approved by the men at first?—I do not know; they all fell very readily into the proposition as to having soup on coming from underground.

2687. (*Mr. Holland.*) Do you not know that the man-engine was just as vehemently objected to by the men?—I think it was.

2688. And did they not adopt it the first week that it was put up?—Yes.

2689. And now they will not go up by the ladders when a man-engine is there?—No.

2690. They will wait three or four hours for it?—Yes.

Mr. Richard H. Williams.

4326. (*Chairman.*) Have you ever thought of any means by which they could be conveyed to the surface without climbing up the ladders?—Yes, I have; I was created an associate of the Royal Institution of Cornwall for a paper that I wrote, and a model that I exhibited for lifting miners out of the mines. It was by drawing them up in a skip with a safety catch to it

4327. Has that mode been adopted?—Yes, it has been. I threw the plan entirely open to the mining population, and it was taken up by some persons, and some little improvements have been made in it, and it has been adopted in one or two mines; for example, in the South Francis mine the men come up in a skip, and I have inspected it.

4328. Is that mine worked according to your own notion?—Yes

4337. What would be the cost, by your plan, of a skip?—The cost of the attachment, merely catching the skip is very little; of course the same guide and skip rope that is in use in the mine would be applicable for drawing up the men

4338. But that is supposing that you adopted the same means of draught as that by which the ore is brought up?—Yes, I do not condemn the plan exactly, I only think that where these skips are used for drawing up the men, duplicate ropes should be kept purposely for that; the same machinery would be safer if there were good duplicate ropes for drawing up the men.

4339. Would you propose that they should come up the same shaft?—Yes.

4340. But of course the machinery for bringing up the ore would be stopped at the time the skip for the men was coming up?—Yes.

4341. Therefore the expense of it would be only the extra ropes?—Yes.

Mr. Francis Barratt.

4431. (*Chairman.*) Do you see any advantage in the use of the skip?—Yes.

(B.)—MODE OF ACCESS AND EGRESS.

(B. c.) *Skip.*

4432. What is the advantage of it?—There are fewer accidents, and less breakages, and it is drawn cheaper.

4433. Do you think there is any less chance of the stones falling out?—Yes.

4434. Therefore you think that there would be an advantage in using the skip?—Yes.

4435. In places where the skip is used, could not some means be devised by which, the skip being attached to the same rope, the men could ascend and descend at a different time from the material?—Yes; I suppose it could be done.

4542. (*Mr. F. Egerton.*) You have stated that the men object to trusting their lives to a chain. Have you ever seen a pair of ropes in use in the collieries in the north?—Yes.

4543. Do you think the men would have the same objection to them?—Of course you mean that the skip should work in guides?

4544. Yes.—I think the prejudice might be overcome.

4545. In that case should you say that the use of a wire rope similar to those which are in use in the north, to enable the men to ascend, would be as satisfactory to them as the man-engine?—I should prefer a man-engine.

4546. On the average, what weight is now brought up in the skip?—15 cwt.

4547. Does that include the weight of the skip?—No, without the skip; that would be about a ton or 21 cwt.

Mr. William Petherick.

5656. (*Mr. Kendall.*) Do you not think that the men might be sent up and down from the mines in skips?—I think so.

5657. Have you seen them in use?—I have; I have used them myself, at small depths; still I know it is practicable.

5658. But your experience is not very great in that matter?—No.

Capt. Richard Boyns.

6854. (*Mr. Davey.*) Would you think a skip safe with a wire rope?—No; because they are very liable to go off the road or trip. I do not think there is any safety in a skip as a transit for men. I am now speaking not of perpendicular shafts, but of underlying shafts. With a good rope and with perpendicular shafts, as in the coal mines, I think that that is quite as safe a way of conveying the men up and down as with a man-engine, and even more so, because there is no changing. A man must have his wits about him with a man-engine to change every 10 or 12 feet. In a perpendicular shaft, I think that a skip would answer with a rope, but not with a chain. I would never go down in a mine with chain unless it was perpendicular, if there were a ladder road.

Capt. Thomas Trahair.

6897. (*Chairman.*) What mode have you for the men to go up and down?—Some of our men go up and down in a skip and others a footway, what we call the ladder.

6898. I believe that you have lately introduced the skip?—Yes, it has been working a year and a half or two years.

6899. Do the men object to use the skip?—They would like to go up and down in the skip very much oftener if we allowed them.

6900. Why do you not allow them?—We cannot allow them to go up and down and discharge, our work time will not allow it.

6901. Is it a single skip?—It is a double skip, and we can discharge plenty of work too.

6902. What regulation do you make with regard to men going down; is it at certain hours?—Yes, seven and two.

6903. I suppose that the tut-work men go down more than the tribute men?—It is more especially for the aged men; we let the young ones walk.

6916. Before it was introduced did you ever hear that the men were likely to object to it?—I never saw any one ride in it before we put in one. All the agents go up and down in it, and we can get from the 140 in two minutes.

6917. How many men go up at a time in the skip?—Two.

6918. Have you two skips at work?—Yes, one going up and the other going down. (B. c.) Skip.

6919. How is the skip hauled up, by a chain or a wire rope?—It is hauled up by a hempen rope, and at the end of that we have a double ⅝ths chain, our hempen rope will heave up 30 tons.

6920. Have you ever tried a wire rope?—No; but I have seen them at work.

6921. Do you see any objection to them?—They may be equally safe, as far as I know; and if they are as safe I also think that there would be a saving on the wire rope. You have not that amount of weight to heave.

6922. Therefore a wire rope would be a cheaper means of hauling up the skip than either a chain or a hempen rope?—Yes, certainly; you must do the one by steam, and it costs more to do it.

6923. Can you state to the Commissioners about the cost of the skip, and the apparatus?—A skip would cost about 20*l.* with catches to it, that is a patent skip, I can let you know.

7001. (*Mr. Holland.*) Referring to the skip, it of course saves the men a great deal of fatigue to be carried up and down the mine in the skip?—Yes.

7002. Cannot the men do more work in the course of a day than they did in consequence of it?—Yes; no question about it.

7003. Can you make any estimate of the value of that extra work so performed by the men?—No.

7004. Do you think it is considerably greater than the cost of so lifting the men?—Yes; the cost of so lifting the men is very little.

7005. But the value of the labour saved is very great?—Yes; more than the cost of lifting them.

7006. Would it not be good policy to increase the number of men you carry up and down at once?—We have talked of putting in four bars for the purpose of carrying more men at once, a skip is five feet long, and we calculate upon putting four bars 12 feet long to run in pairs with sets, so that we could take up 6 or 8 at a time instead of 2, and then the skip would act as a means of safety over the men's heads if anything should come away.

7007. There would be a sort of bonnet over the men's heads?—Yes.

7008. Which they have not got now?—No. We could easily put a cover on the skip.

7009. And you think there ought to be one?—Yes, but there is not on ours, and I never saw a cover on one yet.

Mr. Alfred Chenhalls.

7103. (*Chairman.*) Is a wire rope used at all in any of the mines?—We used it in the Levant mine, it cost us about 500*l.* as an experiment, and it altogether failed.

7104. The wire rope failed?—Yes, as an experiment. We had not the perpendicular shafts that a wire rope should be employed in; the angles of the shaft told very much against the strength of the rope; the friction that took place soon wore it out, and we have had several awkward breakages, and considerable delay and expense.

7105. Are the underlies very sharp?—Yes, in some of the shafts, although we thought that this was a pretty good shaft for employing it in; but we found even there that the underlie was too great.

7106. Had you guide rods for the skip?—Yes.

7107. And pulleys or rollers for the rope?—Yes, we had rollers for the rope at every angle.

7108. And yet you found that the rope wore out?—Yes; it was passed through a barrel of tar or of composition to preserve it and to prevent its wear as much as possible, but it was with us altogether a failure.

7109. Was it by friction that the rope was worn out?—Yes.

7110. Was that the only mine in which a wire rope has been used?—Yes, in St. Just.

Capt. W. Stevens.

8200. (*Mr. St. Aubyn.*) Have you been connected with any mine in which it has been allowed?—No.

8201. Do you consider the skip dangerous?—Yes, with a chain.

8202. How do you think it can be made safe?—If you had a rope you could see where the danger was, but with a link you cannot tell it.

(B.)—MODE OF ACCESS AND EGRESS.

c.) Skip. 8203. You think that with a hempen rope properly looked after there would be no danger?—Yes; you can see then where there is a failure, but you cannot see it with a chain.

8204. (*Mr. Kendall.*) Do the lords in any way contribute to the expense of the man-engine?—No.

8205. Did you ever ask them?—No.

Capt. Charles Thomas.

8679. (*Chairman.*) Do you use a skip or a kibble in the mines?—At West Seton and Stray Park a skip is used; at all the other mines a kibble.

8680. Do the men ever try to come up in the skip at West Seton?—We never allow it to be done, and they do not aim at it, for the ladders there are so easy to get up.

8681. Is there any reason for using a kibble and not a skip in the other mines?—It is principally because of the time that would be required to remove things in a mine 300 fathoms in depth, and to change the mode of drawing would be attended with considerable interruption to our workings, for a mine of that depth. I know the prevailing opinion of the mine agents generally throughout the country; but I think we can show now from our books that we draw in Dolcoath mine, with common kibbles, birch plank, and taper chains, beginning with three quarters of an inch, and coming down to half an inch, as cheap, if not cheaper than any mine in the county at the same depth.

8682. Would it affect the returns to the adventurers and therefore affect the value of the shares?—Yes.

8683. If you found it advantageous to substitute a skip for a kibble, how would that at all put out or derange the work in the mine?—I do not think we could do it in one of our shafts in Dolcoath at all, in less than six months, to make it large enough to take two skips; and to attempt to draw with one would be fatal nearly. The cost would be so great in drawing with a single skip, without any balance against it in going down, it would be much more costly than drawing with kibbles.

8684. You are of opinion that in order to use skips with advantage, it would be necessary to have a double apparatus?—Yes, for all deep mines.

8685. Therefore the shaft would have to be enlarged for that purpose?—Yes, it would be so with us with our old shafts that were sunk a long time ago.

8686. Therefore, although it might be an advantage ultimately to the mine, yet, as it would stop the returns from the mine for six months, the value of the shares would be depreciated?—Yes; and the adventurers could not have their usual dividends. For myself, I do not hesitate to say that if the adventurers were to say to me in the Dolcoath mine, "Throw out the kibbles and put in skips if you like," I should say, "No; I will keep on the kibbles still." We have our shafts now in such excellent order, with birch plank, that the kibble will run over it like over a bottle, with scarcely any friction at all; and the kibbles never touch one another. That was one object in having the skips, that they should not come in contact one with one another, and kibbles do not come in contact one with another. We draw now in Dolcoath mine 12 cwt. in a kibble, and that is the weight which they draw in other mines with a skip. We have a chain such as I have described before.

8688. If you were sinking a new shaft in a deep mine, would you sink it so that you could apply a skip to it?—That would depend upon the underlie of it; with a quick underlie I would certainly. At West Wheal Seton, we had a skip road put in there under my directions, and that I would do again where the shaft is going out, with an underlie of three feet or three feet and a half in a fathom; but with an underlie of only two feet in a fathom, or a perpendicular shaft, my mind would hang nearly in the balance, and I would as soon have a kibble as a skip with a perpendicular shaft, or with a shaft with an underlie of not more than two feet in a fathom.

8689. With an underlying shaft you would prefer a skip to a kibble?—Yes.

8690. Do you keep any account of the cost of keeping the shaft in repair where you use the kibbles?—Yes; it is all put down, it is booked every day that a man is engaged in the shaft, separate from every other cost, and then at the end of the year I had frequently taken out all the cost of the chain and the kibbles, the oil and the enginemen's labour for the year, and then we had, in Dolcoath especially, the means of ascertaining the quantity drawn to the surface quite as full and distinctly (B. c.) Skip. as in any other mine in the county, because we have all the tin stoped by the ton, and we pay nearly all the tut-work men in driving ends and sinking winzes, partly by the ton. Then from that we can ascertain very nearly the actual quantity drawn, and the last account that was made out for the year 1861 showed that the whole of the cost, except filling and landing, which must be done under all circumstances, was 1*s.* 2*d.* a ton for drawing from an average depth of 280 fathoms; that included the consumption of coal, oil, enginemen's labour, chain, kibbles, and repairs of shafts. I doubt whether there is any stuff drawn in the county so cheap under any circumstances.

8691. In Stray Park I think you said you use a skip?—Yes.

8692. Do you keep a similar account there?—No, not so correctly. I cannot speak to the cost there. I have taken the cost in West Wheal Seton as nearly as it could be got, and I find there for the depth that it costs rather more to draw by a skip than it does in Dolcoath by the kibble.

Capt. Thomas Richards.

9003. (*Mr. Davey.*) Do you use a skip there?—Yes.

9004. Do you prefer a skip at that depth to kibbles?—In what relation do you speak as to the skip; do you mean for drawing up the stuff?

9005. Yes?—If you have any shaft not a vertical shaft the skip is the most advantageous, because you can put in wheels to ease off the friction, and there is a great advantage in a skip over the old mode of drawing. If you have a vertical shaft and you divide them there is no harm, because the chains do not foul, but if you draw vertically the nearer you can keep it to the vertical the better.

9006. Do you think that you can draw as cheaply by kibbles as by the skips?—We cannot, I am quite satisfied of it.

9007. Suppose that your mine was 100 fathoms deeper, what would then be the result; which would be the best, the skip or kibble?—There is no question that the skip is the most advantageous anywhere; it must only be a strong prejudice which is opposed to it. When you come to work them there cannot be two opinions that the skip is the most advantageous; it is a common sense thing. Here is a box working in a guide; it does not vibrate or strike against the ground, or anything of that sort; there is no swinging to and fro; when the kibble strikes anything going at a great velocity there is sure to be something wrong.

9017. (*Mr St. Aubyn.*) One witness has given it as his opinion that if the underlie was not more than two feet in a fathom it was more advantageous to have a kibble, but that if it was more than two feet it was better to have a skip. Is that your opinion or not?—I consider that when you go off the vertical line you should have a skip.

9018–19. You would have a skip directly you go out of the perpendicular?—Yes, but there are very few of those cases. In a skip road your skip must be kept in good order, or you cannot work at all, whereas your other shaft will go on working until you cannot go on working any further. If you take the best means of drawing stuff in the country, in the collieries they always work guides to their vertical.

9020. Why should you not have guides in a vertical shaft?—They are advantageous in a vertical shaft. A skip is advantageous in a vertical shaft, it having less friction.

9021. (*Mr. Kendall.*) It is a great saving in a vertical direction, but greater still when you go down in a slant line?—Yes.

9027. (*Chairman.*) Supposing that the shaft is adapted for a man-engine or a skip, and that you put a skip, would not that be a cheaper cost in the first instance than putting in a man-engine?—It would be cheaper, but I do not think that it would be so safe.

9028. (*Mr. Holland.*) What danger do you apprehend?—From the breaking of the chain.

9030. (*Chairman.*) Could you not substitute a wire rope for chain?—I am not so favourable to wire ropes; they answer very well in some places.

9031. What is your objection to them?—In the first place, in copper mines a wire rope will precipitate very fast.

9032. (*Mr. Holland.*) Will it do so if well covered with grease and tar?—They are always well covered

(B.c.) *Skip.* till an accident occurs, and then there is a little bit not covered.

9033. Are those the only dangers which you fear, namely, bodies coming down the shaft and falling on the head, and the rope breaking?—Yes.

9034. If those could be effectually guarded against, you would see no objection?—Not at all; it is only a question of safety. I fear the stuff lodging about the shaft and the chain breaking.

Capt. Joseph Vivian, North Roskear.

9146. (*Chairman.*) Do you use a skip or a kibble for drawing?—In some cases one and in some the other; we prefer the skip wherever we can use it.

9147. Do the men ever go up in the skip?—Yes, but I do not like it. We have not any wire rope, but if we had a wire rope which could be laid on, I would as soon go up in a skip as not; but I do not like it with a chain.

9148. A properly constructed skip, with a safety stop and a wire rope, you would consider sufficient?—Yes.

9149. (*Mr. St Aubyn.*) Why do you make a difference in your mine between a skip and a kibble?—On account of the different inclination of the lode we cannot get the skip to act exactly. Sometimes it inclines to the north, sometimes to the south, and at other times is vertical, and the crookedness of the shaft makes it impracticable to work the skip.

9150. Do you not consider it more advantageous to have a skip in a diagonal shaft?—Yes.

9151. Could not the diagonal nature of the shaft be obviated by proper sheaves?—Yes, but sometimes we could not afford to do it; we have not the means.

9152. If you had the means it would be better?—Yes; a skip is as preferable to a common kibble as good living is to bad living.

9153. Would you have a skip in a right-down shaft instead of a kibble if you could?—Yes, skips are as profitable there as they are in any other place. You can have proper guides, and you may draw as fast as you like, and one never interferes with the other; but with kibbles, they will interfere and do a vast amount of mischief. We had an accident the other day by one kibble coming down upon the other, and it broke both chains.

9154. (*Mr Davey.*) Supposing you had a very deep shaft, say of 280 fathoms, would that alter your opinion as to having kibbles or skips?—I would have a skip by all means in the world there, and wherever I could put it in. When I was at the German mines, I saw that they used a skip and wire rope, and when I came back I was asked what I thought of the German miners, and I said that we are better practised miners than they, but they beat us in drawing the stuff.

Capt. John Daw.

9236. (*Chairman.*) Do you use a skip or a kibble to haul?—We use a skip nearly all through the mine.

9237. You think that that is more advantageous than a kibble?—Yes.

9238. It is more profitable?—Yes, we can work cheaper, we can work and draw with wire rope.

9239. You find the wire rope answer?—We find the wire rope answer much better than a chain, but we must have power, we give out two strokes of the engine to make one revolution.

9240. We have been told that the wire rope suffers by the action of the copper water and other minerals; have you any means of preserving it?—We do not work the wire rope down upon the angle of the lode. We work the wire rope over the horizontal pulleys; then we have 100 or 120 fathoms of chain to the bottom and of the rope. We find that iron does not crystallize the same as it does when it is winding over the cage.

9241. What is your reason for not working the wire rope further on?—The shafts then go away on the course of the lode, and the angle is not regular. We know that the wire will not bear the friction that the chain will.

9242. (*Mr. Holland.*) It is the underlie at the bottom?—Yes. We have about 103 fathoms from the shaft, and then we have a long piece from the cage to the shaft, and that goes down to the underlie.

9243. (*Chairman.*) I suppose that with power and guide pulleys it might be managed?—Yes, where the underlie is regular and well attended to. At Great South Tolgus we work the wire rope some 30 fathoms (B.c.) Skip. from the underlie, and shall go deeper; but then we add to that by putting proper guides and pulleys. At Great South Tolgus we have 14 feet diameter of the cage, and at Carn Brea 12 feet 6 inches.

9245. From your experience of the skip and the wire rope do you think that it might be made to answer for men going up and down?—I do think it might be, but there is a very great dislike among the miners in this country to be lowered by means of the kibble or bucket.

2246. But you yourself think that it might be done?—I do.

9247. You would not object yourself?—I should not object myself, and I should recommend it; but if anything should go amiss I might be tried for manslaughter or something of the kind.

9248. You are satisfied that the working of the skip is cheaper for drawing than the kibble?—I can only say one thing, we have been working in Great South Tolgus six years to the latter part of this summer, and we have only had five skip buckets made there, and we have four of them now in the mine. They have been very much repaired, and in that time we have worn out one wire rope, and I suppose that the quantity which we draw is about 1,200 tons a month.

9249. Do you know what was the cost of the wire rope for the Great South Tolgus mine?—Yes, it cost us 68*l.*, and 250 fathoms of 4½-inch wire rope at Carn Brae cost us 60*l.*, or within 1*l.* of it; the price was 38*l.* a ton.

9250. At Carn Brea how long will the wire rope last?—We have been working the wire rope there about 12 months, and I do not know how much longer it will last.

9251. There is no effect from corrosion?—No; we well grease it, we rub it in well with the anti-friction grease, and we work there 12-feet sheaves over the shaft, and at Great South Tolgus there is a 14-feet sheave, so that the wire rope will not bear to turn quickly upon a sharp angle.

9252. How many kibbles do you think it would take in the same time?—I should not like to work it with kibbles, because one going up and the other down they are very apt to turn round and injure the rope, and very likely destroy it, but when working in guides they cannot do that.

9296. (*Mr. Holland.*) Have you thought about skips for lifting miners?—Yes, and I thought about it before I recommended the man-engine; but our miners in the county have a very great dislike to be lowered in the buckets.

9227. (*Mr. Davey.*) You say that you approve of skips as deep as you work them, in preference to ladders?—Yes.

9298. Supposing that your mine were 100 fathoms deeper, what would be your notion as to using a kibble instead of a skip for drawing stuff?—If I was going 300 fathoms deeper I would have skips.

9299. Are you aware of any mine in the neighbourhood where they use the kibble?—They do in Dolcoath.

9300. But you do not consider that that is the most profitable way of drawing the stuff?—I am quite certain that it is not. I am prepared to test it at any time.

Capt. William Teague.

9361. (*Chairman.*) Is there any reason why you have never tried it?—There are several reasons why we have never tried it. I suppose the greatest is, that we have never been in a position to put down a skip, and the cost would be more than we could think of, and the delay in time; it would take months to put in a skip road in many of our shafts.

9362. And it would stop the mine paying?—Yes, for a certain time.

9363. So that even although it was ultimately to be a great saving and advantage you could not undertake it because it would stop the working of the mine?—I do not know; if it was clearly shown to me that it would be ultimately a great saving and advantage I might be induced to recommend it to the adventurers. I would recommend it to them if I was fully satisfied upon the point.

9367. Did you ever ascertain what would be the cost of that?—No; but the cost of a skip to draw the men would be nothing more than just an additional skip, to which might be attached a safety spring for the purpose of drawing the men. If we put in a skip road we may just as well draw the men over it as the stuff.

(B.)—MODE OF ACCESS AND EGRESS.

Skip

Mr. John Richards.

9441. (*Chairman.*) Do the men come up at all in the skip?—Sometimes they will come up in the skip fast enough if the man-engine is idle.

9589. (*Mr. Holland.*) Do you think, from your experience, that a modification of the skip would supersede the necessity for a man-engine?—Yes, you could put a skip in at a good deal less expense, but then, if anything should occur from the rope breaking, the loss would be more than it would in the case of the man-engine.

9590. What objection have you to the skip, except the chance of the rope breaking?—Because we cannot bring the men up fast enough.

9591. But suppose you brought them up on stages, would it not answer?—Then we must have another machine on purpose for it; it would hinder us two hours a core, that is, two or three times a day, therefore it would hinder us six hours in the 24 in bringing the men up. You cannot go down with the skip more than once in ten minutes, or six times in an hour, and we should not bring them up in that way.

9592. But with a double skip you would bring up twice as many?—Yes, but six times 4 make 24 men, and twice 24 make 48 in both lifts, and we can bring up in 20 minutes with the other 100 men; the man down at the bottom gets in, and by the time he gets up to grass there are 125 steps; that bottom man will have taken half an hour, but when they are on the rope they will not come up quickly enough.

9593. Have you any other objection to the skip?—None at all, I believe

9594. You have mentioned two—the chance of the rope breaking and the loss of time?—Yes, in bringing the men up.

9595. The danger of the rope breaking and the skip falling upon the men might be easily guarded against?—Yes

9597. (*Chairman.*) Supposing you had an extra drum with the means of taking down nine or ten at a time, and two skips to be used only for the men, do you think that would answer?—Perhaps it would, but there would be the extra cost, and we do not want it with us.

9598. But do you think it might be made to answer?—Yes, I think that the skip might be made to answer to bring up the men. If there was any good prospect I should prefer a man-engine, but in a small mine, and with bad prospects, I should prefer a skip.

9636. (*Mr. St. Aubyn.*) Can you state what is the average cost of a man-engine per fathom?—3*l.* 10*s.*

9637. What is the average cost of a skip per fathom?—About 30*s.*

Mr. John Cady and Capt. Pascoe.

9709. (*Chairman to Mr. Cady.*) I believe you have charge of the South Frances mine?—Yes.

9710. Are you the purser of that mine?—Yes, and Captain Pascoe is the manager.

9711. You use a skip at that mine, do you not?—Yes.

9712. How long have you had the skip in operation?—Since 1857.

9713. Is it employed for taking the men up and down as well as for drawing?—Yes.

9714. What was the original cost of the skip, the wire rope, and the fitting up of the whole machinery?—In the statement of those particulars which I will now hand in, I have gone rather over than under the mark in the calculation. I am sure of that.

The following paper was handed in:

Notes on drawing guides, and Skip in use in Marriott's Engine Shaft at South Wheal Frances.

In making the following calculations as to cost of construction, working, &c., 150 fathoms' level from surface is taken as a datum.

Outlay for guides, 150 fathoms at 25*s.*, 187*l.* 10*s.*

	£	s.	d.	£	s.	d.
These guides would last about 10 years with proper attention in repairs, giving therefore a cost per month - - - -				1	11	3
Do. wire rope 300 fathoms - -	50	0	0			
Do. skip, springs, &c. - -	20	0	0			
	£70	0	0			
Calculated to stand 3¾ years would be per month - - - - - - - -				1	13	4
Maintenance of way per annum, 5*l.*, would be per month - - - - - - -				0	8	4
Wages of engine man, lander, fillers, and smith, per month - - - - -				12	10	0
Cost of coal, oil, grease, &c., per month -				10	0	0
Patent fee - - - - - - - -				0	10	0
				£26	12	11

(B. c.) Skip.

The low estimate of 50 tons of stuff and men drawn per day, at 26 days per month, would give 1,330 tons per month=4·76*d.* per ton.

The guides are 6-inch square rods, hoppers, or filling plats to hold as much as skip, and no more.

9715. Has the new system enabled you to effect a considerable saving?—Yes, considerable.

9716. Can you furnish the Commission with accurate information as to what the saving is?—Yes, we can furnish it, I should say, decently fair, or an approximate estimate. The hoppers for filling are the invention of Captain Pascoe, and they are so contrived that they shall hold measure for measure exactly the same as the skip; it was difficult with the old hopper, for when the door fell, that door did not stop the stuff from running into the skip, and Captain Pascoe's idea was that if we had measure for measure, it would be better, as it would then be simply to lift the door, when its contents would fill the skip. During the journey of the skip to the surface and its return the hopper is again filled, so that we can fill with a single skip equally as fast as if we had two skips.

9717. How long is the skip going down and coming up?—About four minutes or five minutes in the usual way of drawing. We could do it faster if we were driven to it. I have not assumed it to be so fast in the statement I have handed in. I have put down 50 tons a day only.

9718. Could you draw more than 50 tons a day?—Yes, we could draw 100 tons a day with the greatest ease by simply employing another engineman, and working a little longer cores.

(*Mr. Pascoe.*) We could pull up 100 tons in rather less than 12 hours.

(*Mr. Cady.*) Yes, if we were driven. The pulleys we use are of large diameter. It is a very important matter that the rope should be wound over a proper pulley.

9719. How is the rope wound?—It is wound round a perpendicular drum, and the pulley over which it goes to the shaft is 14 feet, and the drum is 11 feet in diameter. We could not make it larger.

9720. How do you obviate the objection that has been made with regard to the wire rope corroding?—That is most easily done; we have simply a box that is filled with grease, and the rope runs over the surface of it, and so the rope is lubricated.

9721. (*Mr. Holland.*) Is there a great consumption of grease?—No.

9722. (*Chairman.*) Do you know the particulars as to that?—I have estimated that in the statement I have just handed in.

(*Captain Pascoe.*) There is very little consumption indeed when the rope is got into proper working order.

9723. Do the men make any objection to going up and down by the skip?

(*Mr. Cady.*) No. They make great objection if they are prevented. It is quite the other way.

9724. No man objects to the skip?—No, but we hear great complaints if they do not get up and down by it.

9725. Have you a safety catch?—Yes, Bennett's patent catch.

9726. Can you stop the skip at any level by a signal?—Yes, we can. The nature of the engine shaft is perpendicular to the 30 fathom level. From thence we go on an incline of 18 inches in a fathom all the way to the bottom of the mine; we break that angle by pulleys, or shaft rollers, as they are called, and our roller is nicely contrived; the skip may pass as freely as a bird can fly at the angle; but with reference to the kibble, that shaft being under an underlie, it would be necessary to have bed plank from the bottom to the top, three inches thick, and consequently very expensive; the bed plank, all scantled and sawed out of American and Norway deal, in proper lengths, and sometimes they would haul out, then the chain working upon them would be just like a saw, and they would not stand very

(B.)—MODE OF ACCESS AND EGRESS.

(B. c.) Skip.

long; now we have a skip, and we want nothing of that. It is kept out from the rubbing and the wear by the guide, and consequently the saving is very great indeed.

9727. (*Mr. Holland.*) Have you made any estimate of the saving effected in the available time of the miners by the use of the skip?—The saving effected in the time of the miners is this, that they can come up by the skip in two minutes from the level, and they would have had to climb at least half an hour at that average depth.

9728. To how many men would half an hour be saved?—80 men a day.

9729. What amount of fatigue or labour do you think the exertion used in climbing up would be equal to—as much as an hour and a half?—The old men have remarked to me that they would as soon work half a day as climb up that depth.

9730. What would be a fair average to assume taking the men altogether?—A quarter of a day

9731. Do you mean a quarter of a day's fatigue?—Yes.

9732. Would it be fair to assume that the saving in the wages is equal to 25 per cent. as the result of employing a skip?—About 20 per cent.

9733. One fifth?—Yes

9734. Is not the liability to catch cold diminished by the men being able to come up cooler?—Yes, very much.

9739. (*Mr. Kendall.*) How many men can come up at a time in your mine in the skip?—Five; four can do it easily.

9740. Can they come up in about four minutes?—They come up in two minutes, they descend and ascend in that time.

9741. How many men can you take up and down in a day, so as to keep to their hours?—We can send down four and bring up four every five minutes.

9742. Is yours a single skip?—Yes; we could not with two skips pretend to put a wire rope to any of the different depths with that rapidity

9743. Has it a patent safety catch, so that if the rope break the stoppage is instantaneous?—It has.

9744. Would the man be liable to be jerked out from it or not?—No; they could not be jerked out, as the skip is high enough to cover the neck.

9745. There would be a shock, would it be a dangerous one?—Not at all, the shock would be very little, because at the greatest speed it scarcely goes nine miles an hour.

9746. Have you made any experiments with it?—I have seen the rope pulled right out of the socket by the engineman, when the skip full of stuff caught in the guides, I should think with nearly a ton of ore in it (ascending); we also put on false pieces of hempen rope, to the wire rope and let the wire rope bag, and then we cut the hempen rope in two.

9747. (*Chairman to Capt. Pascoe.*) Have you inspected other mines?—Yes, many.

9748. Do you see any difficulty, in the case of an underlie, in applying the skip?—No, I do not, with proper cars; we are working a wire rope in another shaft in South Frances, and there we have four or five turns, and that is working very satisfactorily indeed.

9749. Are you of opinion that the skip for the purpose of taking the miners up and down might be applied generally speaking, throughout all the mines?—I should say so, most decidedly, of course in many mines where they could probably hardly afford the expense of a man-engine, I think they might pull the stuff up, and send the men up and down just as we do with perfect safety.

9750. And also with economy?—Yes; considerable economy, I should say.

9751. Have you ever considered whether it would be possible to have two wire ropes and two drums, and put one out of gear, so as to have a carriage for the men to go down in instead of a skip?—Our shafts will not admit of that.

9752. I mean setting one aside at the top, and working the other down the same place?—Yes, I understand that; they send them down in the coal mines, I think something like that. I do not think we should gain anything by it.

9753. It has been suggested that there would be a difficulty in sending down a sufficient number of men by a single skip, but if you could send down a carriage containing eight or ten men, as in coal mines, would not that surmount the difficulty?—Yes, but our shafts are not so large, and therefore we could not have a platform large enough.

(B. c.) Skip.

9754. Could not the men stand one over the other in there?—Yes; it might be done very nicely, I think

9755. (*Mr. Holland.*) How would you prevent the wear of the rope in dragging along the floor of the shaft where there is a large underlie?—By rollers.

9756. Those rollers would have to be more numerous in proportion as the steepness was less?—Yes.

9757. Are the rollers a serious expense?—No, a mere trifling expense, just a little bit of oak; they make them in a very little time.

9758. (*Mr. Kendall.*) What is the weight of the rope per fathom?—From 10 to 11 lbs.

9759. Did you ever go down a mine by a man-engine?—No.

9760. You are hardly acquainted practically with the merits of the man-engine?—No, but I know that in a skip there is scarcely any presence of mind required by it as compared with a man-engine; you must always have presence of mind to go from step to step,

9761. What are your changing hours?—At two o'clock, at ten o'clock, and at six in the morning.

9762. You expect all the men to be at the surface or down at the 120?—Yes, they can work for half an hour longer by riding than they could by climbing.

9763. Have you any rule as to ascending and descending?—Yes.

9764. How is it done?—The men receive a signal.

9765. I mean as to the order in which the men get into the skip in going down?—The first pair there take their turn, they do not interfere on with the other.

9766. There is no quarrelling about it?—No

9767. Suppose there were sixty men to come up, the last five would have a long time to wait would they not?—We have never so many as sixty at a time.

9768. What is the greatest number which you have at a time?—Thirty or forty men.

9769. Supposing that there forty men at 2 o'clock, you can only take down five at a time?—They would go down six at a time.

9770. What is generally the number taken down?—Six.

9771. Then the last man would have to wait half an hour?—Yes; but when he goes down he goes fresh to his work at once. We thought it better to have them at one place, because some might be at the 100 fathoms, some at the 114, and some at the 124; and they must give signals from one place to another, and that might cause confusion.

9772. Although the five men who come up last may have to wait half an hour, it does not give rise to any angry feelings among them?—Not at all. If the men at the 100 fathoms wish to go at the 100 they are taken out there. The skip is stopped at the level and they are discharged. The skip is then sent to the 120 at once to take up the pairs of men.

9773. (*Mr. St. Aubyn.*) Are the shafts sometimes right-down and sometimes diagonal?—Yes, they are. Two of ours are perpendicular for thirty or forty fathoms from the surface. After that they go on the course of the lode on an incline.

9774. Evidence of this kind has been given, that where the shafts went straight down kibbles were more advantageous than skips; is that your opinion?—No.

9775. The witness also stated that unless the underlie was more than two feet in a fathom kibbles were better than skips; do you agree with that?—No, I can say this, that if there is an underlie of two feet in a fathom, it would be just as bad as one of three or four feet for a kibble, as it must came up rubbing all the way.

9776. Both for convenience and as a matter of economy, you consider the skip superior to the kibble?—Yes; considerably. We have no trouble whatever now, whereas when we had a kibble we were always in difficulties. I think you will find that the majority of agents in Cornwall will tell you so. There may be probably a prejudiced person or two.

9833. (*Mr. Holland.*) Do you consider it of great importance that all mines as deep as 50 fathoms should be supplied with the means of lifting up the men?—If they employ a skip to draw the stuff, it is of great importance to land the men with the same, we find great use in a skip in case of an accident. We brought up a man who was injured to the surface in a quarter of an hour from the time that he was injured, who other-

(B.)—MODE OF ACCESS AND EGRESS.

Skip. wise, I have no doubt, would have died; we also use it instead of a capstan, as it saves much expense in taking down and putting up our pumps. We have to employ, perhaps from 18 to 20 men at the capstan, and it would take at least five hours to change the pump, to take it down and put it up, and we do it now in an hour and a half without the men.

Note to 9716.—The wire rope now in use was put on in July 1857, and for the five years previous to that date the cost of chain, kibbles, &c., used was 1,142*l*. 1*s*. 2*d*.; estimated costs of repairing shafts, stands, &c., 304*l*.; smith's cost for ditto, at 50*s*. per month, 150*l*.: total 1,592*l*. 1*s*. 2*d*. For the five years ending July, 1862, the cost of the wire ropes, skips, &c., had been 773*l*. 10*s*. 1*d*.; repairs of shaft 25*l*.; depreciation of stock, &c., 75*l*.: total 873*l*. 10*s*. 1*d*. During the former five years the ore sold amounted to 20,836 tons; and during the latter five years it amounted to 21,564 tons. In addition to these results which were so much in favour of the new system, he put the number of men drawn up by the wire rope and skips at 40 per diem, or 1,300 per month, which he calculated as equal to 780 tons per annum, or nearly 4,000 tons for the five years.

Capt. James Pope.

9875. (*Mr. Holland.*) The greater the underlie, the greater the advantage of the skip?—I should say so.

9883. (*Mr. Kendall.*) How do you like it?—I like it very well, it is much easier than climbing.

9884. (*Mr. Holland.*) Do you consider it quite safe there?—It appears to be safe as there has been no accident.

9885. Did you see any cause of danger?—No.

Capt. Joseph Cock.

9964. (*Chairman.*) Do you think that the skips could be made for the purpose of taking the men up and down?—It could be done; but I should not advise it.

9965. Why should you not advise it?—For two reasons: first, I consider that no chain nor rope which might be attached to the wym, is adequate to the work, for safety; and secondly, I fancy that the men would be too impatient, and would go in too many, as there would be no agent to protect or detect them in going up, and even if the rope be strong enough they might have their limbs broken by coming in contact with some timber or ground in coming up.

9969. Do you think that the men would prefer the skip to the ladders?—I think not.

9970. Not if they were allowed to go up in the skip?—I never heard of any in our mine who felt any inclination to do so. I never knew a single man to come up in that way yet.

9971. What weight do you haul up by the skip?—The skip is 7 cwt., and the stuff is somewhere about 12 cwt.; that makes from 19 to 20 cwt.

9972. Supposing that four men came up in a skip, what would they weigh?—Clothes and all, we will say perhaps 1½ cwt. to a man.

9973. Would not a rope which was strong enough to haul up the material be strong enough to haul up the men?—I have known a full skip to come to grass, say with a ton, and I have known the same chain to part in going down empty with the 7 cwt.

9974. Have you ever used a wire rope?—No.

9975. With a chain everything depends on one link; one link is the strength of the chain?—Of course.

9976. If you could get a rope as to which there was no chance of its breaking, and if it did break the skip would not go to the bottom, would you not advise the use of it?—I do not know where we could get that. (B. c.) *Skip.*

9977. You have never seen it?—I have heard of ropes and cables being very strong, to hold, as it has been said, the world, but they have parted.

9978. Did you ever hear of a catch in the skip, so that if the rope broke it could not go down?—Yes.

9979. Have you ever seen it?—I have seen it and have seen it slip the catch. It is not a safe way in any manner, I should say. I would not recommend that.

9980. You would not use it yourself?—I should not like to do so.

9981. You would prefer climbing the ladders?—I would rather do it.

9982. What height of ladders would you climb sooner than go up in a skip?—Any length of any mine in this neighbourhood, to any depth; say 300 fathoms, for instance.

Capt. Zacharias Williams.

11,908. (*Mr. St. Aubyn.*) Do you consider that the kibble is better to bring up with in the right-down shafts?—No, I think that the skip is best with working guides, and a very good plan that is.

11,909. Have you ever brought up any men in the skip?—No

11,910. Do you not approve of it?—No.

Mr. William Goddan.

12,136. (*Chairman.*) For drawing your stuff do you use a kibble or a skip?—At the western mine we use a skip and at the eastern mine a kibble.

12,137. Which is the most economical?—The skip.

12,138. Why then is it not introduced in the other mine?—Because it is a perpendicular shaft and skips are not necessary. A trial shaft is sunk in the course of the lode 80 fathoms.

12,139. (*Mr. Holland.*) How much is the underlie?—About 20 inches in a fathom; the other shaft is perpendicular.

12,140. You have a skip in the under lie shaft, and a kibble in the perpendicular shaft?—Yes.

12,141. (*Chairman.*) Is there any reason why the skip should not be put into the perpendicular shaft if you had guide rods?—None whatever.

12,142. And if it was cheaper it might be advisable to do it?—Yes, the skip is best.

12,143. You consider that the skip is the cheapest and best?—Yes, and the safest.

12,144. Do you use chain or wire rope?—A chain at the western mine, and the same at the eastern mine, but we have a wire rope to put in at the eastern mine when we think that the chain is getting poor.

12,145. You think that a wire rope will answer?—Yes, with a large sheave.

12,146. (*Mr. Holland.*) You do not lift your men in the skip?—No.

12,147. Would you like to do it?—No.

12,148. Why?—It is a very easy road as it is.

12,149. I suppose that they get up in ten minutes, do they not?—Yes, in about that.

Mr. Joseph Matthews.

18,877. (*Chairman.*) Do you draw by kibble or skip?—By skip (both).

18,878. With guide rods?—We have no guides, but there is a rail all the way. The men are not allowed on any account to go up and down by the rail.

(C.)—VENTILATION.

Mr James Barkell.

864. (*Chairman.*) Have you found in other mines that the ventilation was bad?—I have found in other mines a natural ventilation; but ours is an artificial one, as we are obliged to pump our own air.

924. (*Mr. A. Bruce.*) Would you put the whole expense of the apparatus at from 10*l*. to 12*l*.?—The apparatus, I think, would not cost so much; the cost of erection would depend upon the situation, how far it was put down from the shaft.

Mr. Thomas Trevelyan.

(C.) *Ventilation.*

1119. (*Chairman.*) I suppose there are other mines in which you find that the ventilation is not so good as in your own mine?—Yes. I have seen mines which are not so well ventilated, and it is impossible to keep all mines perfectly ventilated at every point.

1120. You mean that when they are driving an end away from the shaft the ventilation must be bad?—Yes. Sometimes objects are to be accomplished, and points to be proved, before we can bring down the ventilation

(C.) *Ventilation.*

which we might desire; I cannot say that at all times perfect ventilation exists in every mine.

1210. (*Mr. Austin Bruce.*) You cannot get good natural ventilation in a close end?—You cannot, sometimes.

1211. But you can always introduce artificial ventilation?—Perhaps you might.

1212. Have you ever seen the close end into which you could not have introduced sufficient ventilation if you had been told to do it?—I do not think that I have ever seen on end but what you could carry artificial air into, provided that you could be furnished with the means.

1213. It is a question of expense?—It is a question of expense sometimes.

1301. (*Mr. Holland.*) As long as the candle burns you consider that the air is good?—Of course it is good; but a man can live where a candle will not burn.

1321. (*Mr. Kendall.*) Do you think that the persons who are engaged in mines are more careful of the miner's health, with regard to ventilation, than they used to be?—Yes, in every sense.

Mr James Seccombe.

1341. (*Chairman.*) Where the men are working down below, is the air good where they are working?—It is not so good as we could wish, and not so good as I expect it will be when we get this second shaft. Now we have winzes; but that is not like coming down from the surface.

1342. How long have you been working at this shaft?—We have been now, I suppose, the greater part of 12 months about this shaft, and we have got from the surface down to eight or nine fathoms below the 20 fathom level; perhaps from 40 to 50 fathoms from the surface.

1343. How long have you been working up?—We have not began that yet, it will take us this month to get in on to the top of the place to begin to rise.

1344. How long do you think it will take you to rise up?—Perhaps three months.

1345. During that time the air, I presume, cannot be good?—During that time we are not so well ventilated as we shall be afterwards. I do not know that the men complain of want of air. I know that when we get a second shaft our smoke and dust and things of that sort have gone off much faster.

1360. In the deepest part of that mine there is only one shaft at present in connection with it?—No; I might say below the 110 fathoms, so that there would be nearly 20 fathoms, one shaft is nearly 20 fathoms deeper than the other, but there is a level driven at the 90 which has many winzes through from the one to the other, causing a thorough draught all through.

1361. At the bottom, where the men are working, is it hot?—It might be termed warm, or rather hot, in our 100 one pair, but not in any other pair; that is what we call the sumpt pair.

1362. Are there any special means used for ventilation there?—No more than we have already done. We intend it as soon as we cross-cut the lode. We shall get on where we have a winse from 80 to 90. It is intended to do it.

1363. But in the meantime, and until you accomplish that, are there any special means employed for ventilation?—They will have the water fall from the 80 down to the 90 perpendicularly, and that throws the water through some pipes to keep this level cool and fresh; that is the 100, and that will be required before the winze is communicated from the 90 to the 100.

1364. Then that is artificially ventilated by means of water?—Yes.

1365. It is perfectly ventilated?—Yes.

1366. Is there any place in either of these two mines where candles will not burn?—Not now, that I know of. We have one level that we have suspended for 12 months, our 80 west. That is done on account of a change of weather at the surface, not otherwise, and that we suspend before we get other levels up.

1367. You suspended the working in that level on account of the air not being good?—Yes, 12 months ago, because when there are uncertain winds and not clear weather at the surface there would be an occasional change, when the candles would not burn so well, and we have suspended it before we get other levels up to drive the air on by winzes.

(C.) Ve
tion.

1368. The natural ventilation of the shaft is affected by the weather?—Only on rare occasions. I am not aware that I know of it in any other place besides that.

1369. How far was the end from the shaft when you stopped the working?—I should think perhaps 70 or 80 fathoms; not quite so much as that perhaps, say about 63 fathoms.

1370. While the men were working there, and before you ceased working, were you entirely without ventilation?—Yes, they were.

1509. (*Mr. Holland.*) Are the men more careful in avoiding the poor air than they used to be?—I do not think they are, but I do not know that there are such bad air places as there used to be thirty or forty years ago.

1510. (*Mr. Kendall.*) In East Caradon have you got bad ends which sometimes contain bad air?—I do not know that we have any that may be called very bad. Our fifty might be taken to be rather close, but not injurious.

1511. Does the candle burn well there?—I cannot say that it does.

1512. Have you taken any means of forcing any air into it?—We have got a winze through from thirty-five down to fifty, and then we manage to carry the draught back over the stopes to bring it as near, in order to play round the end, as we can, and then we have winzes from there to sixty.

1513. How far is the fifty end from the winze?—I cannot tell you how far it is from the winze, it is brought on by the stopes; I think we must be thirty or thirty-five fathoms, perhaps; I think we have got that ground on the stope. I think that is the worst end. We carry it round the draught as well as we can.

Mr. William Rich.

1608. (*Mr. A. Bruce.*) Do you think that these sufferings are almost the necessary consequence of the men working underground in the copper mines, or do you think they can be prevented?—There are places where it is impossible to obviate them.

1609. Why do you suppose so?—Because there must necessarily be bad ventilation; you cannot convey the air, it is very difficult, in a hollow piece of ground, to do so; the machinery sometimes is inadequate for the work.

1610. Is it because it cannot be done, or because it is expensive to do it?—Sometimes it cannot be done, and at other times it is expensive, but any man with reason will do all that he can to remedy it.

1646. (*Mr. Kendall.*) Have you seen the men working in bad air which might have been easily remedied by a small outlay?—Yes.

1647. Do you think that the agents are accountable for that state of things, or that the agents desire to please the adventurers?—I do not think that the adventurers ever control them.

Mr. Richard Pascoe.

1764. (*Chairman.*) Does it take sometimes as much as two or three months to complete a communication?—Sometimes two or three months.

1765. Does it ever take so long as six months?—Yes, to ventilate a good place.

Mr. Peter Clymo.

2368. (*Mr. A. Bruce.*) I suppose that a certain portion of the close ends, do what you may, are ill-ventilated?—There are some, but not a great number, but then you find, as I said just now, that there are winzes sunk as often as it is at all advisable. With a regular mode of mining, and when there is a long distance between the winzes we always endeavour to put in a machine.

2369. You do your utmost to diminish the evil, but still it exists, and must do to a certain extent?—It must exist in certain places, particularly in cross-cuts.

2379. Have you close ends to drive which must be driven whether the ventilation be good or bad?—Yes, for instance, suppose that you had got a winze coming down here (*describing the same*), and the level coming on towards it, and this (*pointing to the same*) was a good way off the winze, it would be a very considerable expense to relieve it, and then perhaps you would not have more than a fathom or two to drive to alter this winze, when you would have plenty of ventilation, and the men might be working in a bad place just at that time

2380. You said that the candle indicates the existence of bad air before the men feel it?—Yes.

2381. Are you sure of that?—Yes; I have been many times in places where the candle would not burn. I have worked on a tribute where I had the candle, perhaps, seven or eight feet behind me, it would not burn where I was working, and we were doing very well, and you do not think about the injury then.

2382. But you were injuring yourself?—Yes, no doubt about it.

2383. You have told me that you have worked when actually the candle would not burn, and my question is whether to a cerain extent the air would not be tainted even before the candle by not burning showed the condition of the air?—No; you will find that wherever there is a little failure in the air the candle will show it, and instead of having the candle upright it must lean; as the air gets worse you must have it down in a horizontal way.

2393. (*Mr. Kendall.*) And you came to this conclusion when you were a tributer, that you could often work in an end where the candle would not burn, and you put it back some eight or nine feet behind you?—Yes.

2394. Then the candle, according to that, is more sensitive than a human being?—Yes.

2395. You can work where a candle will not burn?—Yes: the candle, in the place that I spoke of, the moment you put it in, went out directly.

Mr. William Cock.

2612. (*Mr. A. Bruce.*) Were you none the worse for that?—My staying in it was short, only just to examine it; that was one place that we have now raised from one level to another to give better ventilation, and in rising in this place the air was very scanty.

2613. What did you do?—We effected a communication between the two levels by a rise.

2614. How long was the air scanty?—For about three months.

2615. Were you working there all the time?—No; I was then an agent.

2616. Were there some men working there for the whole of the three months?—Yes.

2617. Were they the worse for it?—No, they are still working in the mine.

2618. Were they any the worse for it at the time?—No.

A Miner. No. 1.

2799. (*Mr. A. Bruce.*) Were the close ends well ventilated?—Some were well ventilated, and some were driven a long way from any draught.

2800. Do you call a close end well ventilated in which you suffered in the manner in which you have just described?—No.

2801. Do you think that that could have been avoided?—Yes, I think it could.

2802. Did you ask the agent to improve the air?—We generally complain of having poor air when we have it, and try to have a machine to blow air to us; sometimes we get it, and sometimes we cannot.

2803. What was the reason why you could not get it?—I do not know, it might be done if they had a mind to put it for us.

2804. (*Chairman.*) Have you ever been refused?—Yes.

2805. You have spoken to the agents, and they have refused to put it?—Yes they have refused to put it.

Mr. Andrew Kingston.

3354. (*Mr. A. Bruce.*) Then it is a question between the lives of men and the development of poor mines?—You cannot get over this difficulty, that in mines where they have only one shaft the ventilation, as of course must be obvious to any one, cannot be perfect; if you put down two shafts you stop the mines at once.

3355. Then you distinctly say, as within the experience of your medical practice, that men working in mines having but one shaft are, as a body, more unhealthy than those working in mines with more shafts?—I have known in some mines in my experience where they have had only one shaft that the men have complained that the air has been very poor, and that they have suffered from it.

(C.) *Ventilation.*

3356. And have you observed that they did suffer?—Yes, most assuredly so.

3362. (*Mr Kendall.*) Are the cases very rare which you have been called to attend of men suffering exclusively from having worked in a badly ventilated end, a badly ventilated rise, or a badly ventilated pitch?—They are few. From the general mining work they are not in the good condition in which other men of between 20 and 30 are.

3363. From the information which you have been able to get from miners whom you see, are you not of opinion that in the majority of mines in this district the natural ventilation, *quoad* ventilation, is good?—I am of opinion that it is good, decidedly.

Mr. Robert Dunstan.

3449. (*Mr. A. Bruce.*) Is there anything else?—Yes, the foul air that they breathe, and that they are obliged to work in.

3480. Do you consider that all the means have been exhausted by which ventilation can be provided for the tutwork men?—No, certainly not.

3481. Even in the best ventilated mines?—No.

3490. In the mines in which you have been engaged were there no close ends that were insufficiently ventilated?—Yes I have worked in places where I have been obliged to keep the candle six feet behind me, for a man can breathe where a candle will not burn.

3553. (*Chairman.*) If the miners are working in poor air is that taken into consideration, and is a larger allowance made to them?—You must give them more, or they could get nothing. They could not do half the work that they otherwise could do.

3554. Then it would be clearly for the interest of the adventurers that a mine should be well ventilated in order that the men might do more work?—Yes, but take what care you can the men must of necessity be exposed to foul air.

3632. I suppose it is only in young mines that there is but one shaft?—Some mines are worked to a considerable depth without more than one outlet, but it is never safe to do so. In well-conducted mines we do not allow the men to travel through the shafts; there is a private footway on purpose for them.

3633. When there is only one shaft it is divided between that and the kibbles, is it not?—Yes, and then there is an engine working up and down, which makes it dangerous for the men to travel through. All mines should have a private footway apart from all the engines.

3634. So that if any obstruction happened in that one shaft the men would have a way to retreat?—Yes.

3635. Are the shafts lined with wood?—Yes, but some of the footways in them are very bad. The kibbles falling away knock away the casing and make large holes, which render it very dangerous.

3636. That is, if any material were to fall down and break through the division it might endanger life?—Yes, many men have been killed by it.

Mr. William Wale Tayler.

3806. (*Mr. Kendall.*) And as a general thing you have not heard the miners complain of working in bad air?—No, I have heard miners say that the Fowey Consols are better ventilated than other mines to which they have alluded in the west.

Mr. John Pearce.

4002. (*Chairman.*) Where was that mine?—It was in this neighbourhood. They suffered very badly, and I would account for that by the ventilation not being so well attended to there, as they had not so much necessity to drive out the smoke from the powder, there was very little blasting, and the ground being easy retained the damp to such an extent that the timber would often become loaded with fungous growths, and all the atmosphere would be dead and heavy. The men in those days were in the habit of drinking more in that district, and they would often go down half drunk, and sleep underground; but the Beam mine was observed to be one fertile source of the peculiar disease called the miners' disease.

4027. How long do you think a miner could work in that kind of air without suffering?—That depends upon the degree of impurity that there is. In some cases such rises are nearer to another rise than in other cases; it depends upon circumstances, they judge of it by the way in which the candle burns; if the candle will not

(C.) *Ventilation.* burn unless it be turned down, or even than that it would go out, I should say that the air was very bad; if the candle burned steadily on its side then it is considered that where a candle will burn a man can live.

4028. Is it your opinion that where a candle will go out when it is held upright, but will burn on its side, the air would be very bad?—Yes.

4029. The air would be bad if the candle would only burn on its side?—Yes.

4030. Therefore you would recommend any patient of yours not to return to that kind of work?—The work must be done, or they could not get the ventilation for further working. I think the agents do not keep the men at it; if the men have been put on a rise and they have got on with it, probably the men would not have to do that for months again, and they could not get the natural ventilation without.

4031. You would recommend a patient of yours not to go back to the same kind of work?—Yes; but they do not complain immediately of this; they may come and complain of lightness in the head, but they do not complain of the miners' disease immediately.

4032. If a man came and complained of lightness in the head, should you then advise him not to go to the same description of work again?—That would depend upon the extent of it; he might be laid up for a day or two, or more, and then he would go to work again at the end of the week, and in a week or two the natural ventilation would take place.

4033. But suppose it did not take place for more than a month, would you in that case recommend your patient not to go back again?—Under such circumstances, if he was so bad as not to be able to work he would be laid up, but if he could go to work he would probably go back to the same place. If I saw him suffering from tightness at the chest, I should say, "You must tell the captain," so and so. "I do not consider you fit to work there," that I have often done.

4034 Still you say that the work must be done, and if that man did not do it somebody else would do it?—Yes.

4035. That is to say, if one man's health will not stand it another man must try?—Yes; but it is for so short a space of time.

4036. Are you able to speak from experience upon that?—Yes; I know something about these matters. I have been an adventurer as well as a medical man in the mines.

4037. How long has it taken to get through the work in your experiance?—That depends upon whether they sink from below, and that they would do if the air was very bad; it depends also upon the character of the ground, whether it is very hard or not.

4038. May there not be occasions when it would take some time before they could complete the work and obtain the ventilation?—Yes, it might be two or three weeks.

4039. During that time if one man suffered from the poor air, and was laid up, another man would have to take his place?—Certainly.

Mr. Richard H. Williams.

4353. (*Mr. Kendall.*) You say that you have given your attention to the subject of ventilation?—Yes, I have.

4354. Has the ventilation of mines been improved since the time you can recollect?—I think that the plan I am now adopting, and have adopted for some years, has been approved by Captain Charles Thomas; he inspected the mine, and he said that he believed a level could be driven any distance with that, that is by a water jet.

4355 Is that different from the old water jet?—Perhaps it is not. I do not claim exactly the merit of inventing the thing, but I claim the introduction of it in the Cornwall mines.

4356. To what distance does the water jet enable you to carry air in?—The furthest distance has been 100 fathoms.

4357. Where is that?—At St. Austell Consols.

4358. Is the air very pure in the end?—Yes, that which comes in the pipe.

4359 You mean the air which is sent in?—Yes.

4360. Does it enable you to burn a candle without any perceptible difference?—Undoubtedly it does in the end.

4361. What do the men think of that?—The men say that they never saw such a machine before.

4362. Are they pleased with it?—Yes. I set a pair of men the other day to raise a shaft from the 85-fathom level to the 70 fathoms. (C.) *Ventilation.*

4363. Fifteen fathoms?—Yes; it is 15 fathoms perpendicular, but this rise has gone up in the under lie, so that the measure of the rise was nearly 20 fathoms.

4364. What is the distance from the rise to the draught?—The last place where there was good air was at 80 fathoms, and I put in this machine, and the air in the top of that rise was as pure as it is in this room, except the heat from the candles.

4365. What was the expense per fathom of doing that?—The iron pipes cost us about 2*s.* 6*d.* a fathom, and the zinc pipes about 5*s.* a fathom; they are easily put together, they are all of iron like gas tubing, and they screw universally; there is no trouble in fitting them, and two men in three days would put the thing in.

4366. What was the cost of keeping the action up?—A powerful machine put in with an inch pipe and about a two inch rose with 16 holes, would cost us about half a stroke per minute to a 12-inch lift, or equal to about 400 cwt. of coals a day. The water is taken from a high level and conveyed down into the mine through a small pipe, the height gives the pressure, the outlet is much less in proportion, owing to the small hole and that creates a jet. That jet is blown in through a large wooden pipe, and after being passed in some three fathoms the jet throws the water about three fathoms through this pipe, and consequently all the air is knocked out, so that it forms a sort of natural vacuum, and the air rushes in at the back, the draught is so great that it will put your candle out.

4367. You have stated that zinc pipes would cost you about 5*s.* a fathom?—Yes.

4368. After your arrangements are complete what is the working cost?—That depends upon circumstances

4369. Do you employ a boy to watch it?—No; nothing but the men who go down to relieve look to it.

4370. Is it self-acting?—Yes.

4371. What extra cost per month do you think accrues from the use of this machine in taking up the water that you throw through the jet?—It requires a little explanation. I have a very powerful one now working at the 124 fathoms in the Charlestown mines, supplying seven men in the cores; there are two men in the end, two in the cross cut, and three men cutting out the lode, and this is giving those men a full supply of air now. It cost us nothing, as it is taken from a high level, and the water would fall from that level, and be conveyed down through wooden pipes to the 124-fathom level, for in case that machine was not working, the same water would have to be brought down to supply that lift. It occurs in the mines that we graduate our lifts in size as we go down, a little smaller, so as that each lift shall only be sufficiently large to take away the water, but it occurs at the under levels in the water time that the top water comes in and overflows the top lifts, and we have to work the engine much faster, consequently our bottom lifts go in fork; that is they have not a sufficient supply, and that injures the work, it forces the air, and causes a great concussion of the valves, we obviate that by having a wooden pipe from the top to the bottom: it goes down and it conveys a sufficient quantity of water.

4372. So that this machine costs you nothing when it is once in operation?—Nothing at all, but in some mines it would; in some mines where they are driven up on account of pumping, every lift is sometimes full of a quantity of water, and to take away that would be an additional cost. When the engine is brought to its full maximum load the speed of it would entail a considerable amount of cost, and perhaps cost 20*l.* or 30*l.* a month, and that might endanger the machinery by forcing the engine faster than it would go.

4373. Under ordinary circumstances you are of opinion that when once you have incurred the expense of erecting this machinery, the sum of money required to keep it in working order would be merely nominal?—Yes.

4374. (*Mr. Davey.*) In ventilating a level, which is the best principle to act upon, to extract the foul air, or to force in pure air?—To drive in pure air, I think.

4375. Have you seen your plan tried in any other mine than your own?—No.

4376. (*Mr. Kendall.*) Did the miners under you suffer much from foul air before you adopted this machine?—

(C.)—VENTILATION.

We could not have done the work without it; we must have had either that machine or some other, and I have found this most effectual

4377. Did you use any other artificial means before you adopted this principle?—Yes, I have used the fan machine; I have had six boys driving the fan, two boys in each corps, each eight hours, and I find that those little boys flag at their work, the fan stops, they drive too slowly, and they do not throw in the air

4378. Did those fans throw in fresh air?—Yes; I applied a little water-wheel underground with very great success, and I think that has been done in Polgooth as well. I am now putting it into the 124 fathoms at Charlestown to drive the fan there, it is a water-wheel, a 10-feet wheel.

4379 (*Mr. Holland*) Are you now working the 80-fathoms with no other mode of ventilation but the jet?—Yes.

4380. (*Mr. A. Bruce.*) How long has this plan been in operation?—I have worked it for about seven or eight years.

4381. After the account you have given of it, I presume that there is no close end to which it would not be applicable?—I could not say that, because sometimes we have got a driving shaft, and where we have not got a skip rope or some means of steadying the kibble, if we bring our iron pipes down that shaft this thing would knock them out. A level driven from the driving shaft would not be so easily ventilated by that means if the ordinary fan could be used.

4882. Are you now working close ends under two systems?—Yes.

4383. Are the men in your opinion in the one case able to work more vigorously than they are in the other?—I think that they work more hours.

4384. Do they work longer than the ordinary eight hours?—No; but in the one case there is so good a supply of air, the current is so great that the smoke of the powder, after a hole has been blasted, is instantly blown away, while in the other case the draught is so little that the smoke is merely floating.

4385. In letting work do you believe that you are able to let it more economically to your employers in well ventilated mines?—Yes.

4386. Have you had practical proof of that in your own mine?—Yes, I set a pair of men on Friday last at St. Austell Consols to cut through a lode. I gave them 30*s.* a fathom more than I should have given them if they had had a full supply of fresh air.

4387. How much would you have given them then?—About 45*s.* a fathom, and I gave them 3*l.* 12*s.*

4388. If that is at all a fair instance to give, the difference must be out of all proportion to the expense of erecting and maintaining such a machine?—Yes, no doubt it is.

4389. Is it as applicable to the rises as it is to the close ends?—Yes.

4390. It can be applied vertically?—Yes.

4391. Have you done so?—Yes.

4392 And always with the same economical effects as well as the same healthful effects?—Yes. I put in a rise through to the Charlestown mines 20 fathoms, and I do not think that any other machine would have done it, we should have gone to the level and sunk part of the way, but we had the machine there, and so have risen part of the way.

4393. Has this machine been examined by other engineers in the district?—It has been examined by Captain Charlee Thomas and Captain Mitchell.

4403 Is there anything that you think is injurious to the health of the miner from the smoke of the candles?—I think that the most injurious effect of the candle is that it takes up the oxygen and leaves the carbon, of which there is an excess. I believe that Professor Phillips has spoken of introducing an apparatus for generating oxygen, but I think he is quite mistaken as to mining; what we want is a moving atmosphere.

Mr. Francis Barratt.

4606. (*Mr. A. Bruce.*) I know that the fact is so; but what I wish you to explain to the Commissioners is, why it is not possible to do in copper and tin mines what is done in coal mines?—I have seen a large mine that the men could not go down more than two or three fathoms below the surface of a morning in still foggy weather, and yet in the course of six hours that air would be driven away, and the men could resume their work; this, of course, was in a valley.

4631. Is there any reason why the very deep mines should not be as well ventilated as yours are?—I think that there is more difficulty in deep mines than in shallow ones.

(C.) *Ventilation.*

4632. But why so?—The current is not so strong at the bottom.

4633. Ought not the current to be rather stronger in deep mines, where there is a greater difference between the temperature of the top and the bottom of the mine, than in shallow mines?—We do not find it so in practice, the current is not so strong in deep mines as in shallow ones; I do not know why it is so, but so it is.

4634. In a question affecting the health and the lives of men, wherever difficulties in the natural ventilation occur, ought not artificial means to be resorted to to assist the natural ventilation?—Yes.

4635. And do you know of any case where, by the joint use of artificial and natural ventilation, sufficient air cannot be introduced?—No, I do not.

4636. Do you think that the question of cost would interfere with a sufficient supply of air?—Yes; it may be so.

4648. (*Mr. Kendall.*) What is your opinion about the down-cast and up-cast; as I understand you there is no regular down-cast and up-cast in your own mines?—I have found it to be so in practice.

4649. Did you ever find the want of a draught in a mine where there were two shafts?—Yes; I have.

4650. Was the air dead?—Yes.

4651. For any length of time?—I have known it to be so for a day.

4652. For how many days in a year have you known that state of things to exist in your mine?—I have never known it in winter, but in summer, in very hot weather—dull, heavy weather.

4653. Your supply of air, when you use artificial means, is of course taken from the main draught, that is from shaft to shaft and from level to level?—Yes.

4654. Are there times when you have no air there to pump in?—Yes; and the men cannot go down.

4655. On those occasions the men do not go down?—They cannot, they have no light; the candle would be quenched in a moment.

4656. Has that occurred several times within your knowledge?—Yes, at East Crinnis, and at Pembroke in the valley.

4657. Have you ever heard of that being so in any other mines in the neighbourhood?—No, I think not.

4658. Speaking generally, where you have a connection by a shaft, have you not generally a good through draught?—Yes.

4659. Very good?—Yes.

4660. Does not the candle show you sometimes that it is very strong?—Yes; you are scarcely able to keep the candle burning on account of the draught being so strong.

4661. In those exceptional cases the men do not go underground?—They could not go down.

4662. Do you, or do you not, when you find there is bad ventilation at once resort to artificial means?—No; a few hours would remove it, a change of wind would do it

4663. But I mean, generally speaking, in the ends?—Yes, they always adopt means immediately to send in air, either by fans or by bratticing.

4664. Have you ever known instances where, when the men have complained, and the complaint has been well founded, they have remained for three days, or four days, or a week, before they have ceased to work?—No.

4665. You at once attend to it?—Yes; the men would be ill otherwise. I never ask the men to work in poor air, I tell them to stop.

4666. I suppose the men do stop before they give you notice?—Yes; the tributers would be in a back level, perhaps in poor air.

4667. Comparing the tributer with the tutwork man, which do you think is the longest lived?—I should think there is not much difference, I should say they are just the same.

4668 Have you found that the deprivation of light for eight hours has something to do with the health of the men?—I do not know in what way.

4744 (*Chairman*) Although there may be a strong draught in your mines with many shafts, are there no ends in which the air is poor?—Yes. I suppose in some deep mines that the heat is so unpleasant, either from the weather or from the ground, perhaps from both, as that really the air is difficult to breathe.

(C.) *Ventilation.*

4745. And yet notwithstanding in parts of the mine the current is so strong as to blow out a candle?—No, not the current there.

4746. But in other parts of the same mine?—Yes.

4747. Have complaints often been made to you of the poor air?—No.

4748. Do you know that the men do complain sometimes of poor air?—Yes; I have known them complain some 20 or 30 years ago.

4749. Do they not now complain within your knowledge?—No; they say that the air is rather dead, and we take steps to improve it.

4750. But in driving an end in a new mine to reach a shaft, it is necessary, is is not, to work in that end where the air is poor?—Yes; but we either put in collars at once, or a fan engine, or a water-fall.

4751. But if neither of those things is done what is the consequence?—Then the air would be bad.

4752. Are there air machines in every mine?—I cannot say that.

Mr. Francis Puckie.

4808. (*Mr. Kendall.*) Before you begin to sink your winzes I suppose the ventilation begins to fail a little?—Yes; of course the place gets close, and sometimes we are obliged to get a machine to blow air in.

4809. After you find the air begin to fail, if you are near holing, I suppose you proceed without any machine?—Yes.

4810. Have you now got to the point where you have your ventilation?—Yes; that is the very thing we want.

4811. Is that what you call not a good end?—No.

4812. It is not a bad end nor a good one?—No; it is warm, the air is very warm.

4813. How will the candles burn?—They burn pretty well.

4814. But you want better air?—Yes; and as soon as we ventilate it will destroy the heat.

4815. At the depth of 270 fathoms, the moment you ventilate, does the place become cold?—Very moderately so indeed.

4820. Have you used any artificial means to throw in air at the end of the 270 fathom level?—No.

4821. Shall you delay doing that much longer?—No; we shall be obliged to do it bye and bye; we shall put a machine there.

4822. How do you judge when it is time to have recourse to artificial means?—When we come to get the air bad the candles refuse to burn; and at other times when we go in it is so hot; and the powder smoke lies there; that we use artificial means to bring in air to destroy the heat and destroy the powder smoke.

4823. At present you can work on; but you see that it is time to be looking forward?—Yes.

4829. Supposing that it was in full operation, taking into account all the levels, most of which you know, in how many ends in the whole of the mine do you fancy there would be what you call bad air, or not very good air?—There are many places in which there is bad air.

4830. Supposing you were to put men to work in all the different ends, there would be many in which there would be bad air?—Yes; but it is more from the poverty of the vein than from the poverty of the air.

4831. If those veins should continue, should you adopt artificial means?—Yes; and no doubt there were artificial means to supply air there before the ends were stopped.

4832. How many ends have you got in Fowey Consols now where you ought to resort to artificial means of ventilation, or where you are about to use artificial means?—We have three or four.

4833. In which the candles now do not burn freely?—Yes; where we use artificial means.

4834. How many ends are there now in Fowey Consols where the candles do not burn freely?—I do know but of two.

4835. Which are those?—One is the 180 south, and then the new shaft; then we are now going to give orders as we did last year to get pipes to put in.

4836. How far is that from any ventilation?—I should say 100 fathoms, or very nearly so.

4837. Is there no artificial ventilation there now?—No.

4838. Do the candles burn dead there?—No; they burn very freely. The chief object in introducing ventilation there by artificial means is because we will not put another pair of men to work there; we consider the air is hardly sufficiedt to supply two pairs of men.

(C.) *Ventilation.*

4868. How far in is it?—I suppose 30 fathoms.

4869. From any winze?—Yes.

4870. How is ventilation effected there?—There we are sinking a winze to ventilate.

4871. What sort of air is there there?—It is rather close.

4899. (*Chairman.*) You stated just now that in driving a level, if you are near to an end, where you put in a winze, you endeavour to proceed, and do not stop the work although the air is bad?—No; not if we possibly can keep them working, and particularly if it is a place of importance; but we use every means to supply air to enable the men to work.

4900. I suppose that in those instances the men are obliged sometimes to work where the candles burn dimly?—Yes.

4901. For how long would the men probably work there; a month?—They may sometimes work there a month.

4902. Or for two months?—I do not know that exactly; but there is a great deal of difference at times, and it will depend a good deal upon the atmosphere at the surface; some days we may have in certain ends as good air as the men need work in, then upon a change of wind at the surface perhaps, you may go down the next day, and you cannot carry a candle into the end.

4903. When that is so, do the men come up again?—Yes.

4904. They must then stop work until the wind changes?—We generally employ them somewhere else.

4905. But if you have no other work for them they must stop?—Yes, certainly.

4906. And they do not, I believe, get paid all the same?—No.

4907. How long have you known a man out of work under such circumstances?—Perhaps not two days.

4908. And he does not get paid as if he were at work?—No; they are always on tutwork or on tribute work.

4909. You have stated that as soon as you can ventilate a place the heat is diminished?—Yes; as soon as we can get in ventilation that destroys the heat, we get then a current of air.

4910. That is to say when you put a winze in?—Yes; then we go on again as fresh as ever.

4911. But until that is done, must not the men work in a close place?—Yes.

4912. Do you judge of how long the men can work by the candles, or in what way?—The men can tell that by their working, and sometimes at the end of a corps the air may get thicker than at other times, and then they may blast a hole just before they leave perhaps, then they will go up.

4913. I suppose the men will endeavour to work on as long as they can?—Yes; the more they work the more they get.

4914. Although the air is bad, yet they will endeavour to work on?—Yes; some will work very much longer than others.

4915. I suppose that a young miner who has not suffered at all in his health will work longer than a man who has suffered?—I do not think there is much difference; some of the older ones will persevere even more than the younger men.

4916. In poor air?—Yes; but I suppose that our mines are as well ventilated as any mines in the county; still we have on certain occasions bad ends.

4917. In these ends where the powder smoke hangs about, are the men able to work on soon after they have blasted?—Sometimes they are obliged to stop half an hour after they have blasted a hole, sometimes a little longer, and sometimes, perhaps, not quite so much; in some places, perhaps, they may not stop scarcely at all.

4918. I suppose that is where there is a current of air?—Yes.

4919. Where there is not a current of air, or ventilation, they have to stop half an hour?—Yes.

5121. (*Mr. A. Bruce.*) You say that the men never complained to you?—But seldom; you may find them complain occasionally.

5134. But do you think that men work long in places where the powder smoke remains half an hour?—Yes.

5135. Without injuring their health in the long run?

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—I cannot say about that, I do not know but what it might injure them, but I do not think that it would injure them so much perhaps as a good many would calculate upon.

5140. Have you, either at the Fowey or at the Par, any shafts which are always used as down-cast, and any which are always used as up-cast?—No.

5141. Upon what does it depend whether a shaft shall be an up-cast or a down-cast?—They change, we often found that they change; sometimes the air goes down one shaft, and it may come up the same shaft, and down one and up the other; they will change occasionally.

5142. Do you think that it would be a good thing so to direct the currents of air as to make some shafts always the up-cast and some always the down-cast?—Perhaps it would be a very good thing, or it might not be; we cannot tell. Sometimes perhaps we might ventilate one part of the mine best, and at other times we might ventilate another part of the mine best, so that which might work the best upon the whole we do not know.

5143. Have you the management of the ventilation?—Yes. If we think that any thing in the way of ventilation is necessary we give orders to put in trap doors, and so on to throw in air to a certain place.

5144. Who is it that judges what should be done for the ventilation of the mine?—The agents do so.

5145. Are you one of those agents?—Yes.

5146. Is one more than another responsible?—No.

5147. Each is responsible for his own mine?—Yes; we all consult each other; one is responsible as much as the other.

5149. (*Chairman.*) You have said that you expect in about a month to sink a winze which will ventilate the end where there is poor air?—We hope to commence it in about a month.

5150. How long will it take before it is done?—We cannot tell to two months; it will depend entirely upon the nature of the ground.

5151. You cannot tell how long it will be before it is completed?—No.

5152. It may be three or four months?—Yes.

5153. It may be six months?—No, I do not think that

5154. It may be four months?—It may be four months.

5155. Until that is done that end cannot be properly ventilated?—No, except by machines.

5156. (*Mr. Kendall.*) You can get no natural ventilation?—No.

5157. But you can force air in before that?—Yes.

4878. When the miners find these places close, do you put in a machine?—Yes, as soon as we find that the men cannot labour as they ought to do, we use other means to bring air to them

4879. Do the men ever complain of bad ventilation in your mines without your at once endeavouring to remedy it?—No, never; sometimes, of course, they will complain before they have any need to complain.

4880. Is that when they have made a bad bargain?—Yes; or if they want to come up sooner they will plead an excuse, saying that the smoke is bad, or anything of that kind.

Capt. John Webb.

5317. (*Chairman.*) How far from a natural means of ventilation would it be safe in ordinary cases for a miner to work in an end?—I do not think that they ought to work beyond 20 fathoms, although some places will convey air better at 40 than others will at 20. But there should be some artificial means when a level or gallery is driven on beyond 20 fathoms from a current or draught; I think that there should be some standing rule of that sort.

5318. Must not that differ according to the depth of the mine?—No; I have seen the air as bad five fathoms deep as down 100.

5365. (*Mr. F. Egerton.*) It depends upon the captains?—Yes.

5366. It varies according to the captains?—Yes; some captains having no thinking powers; they do not regard the health of the men. But I have long argued that there is no reason for men to work in a close, dense atmosphere, and that a little artificial means might be used

5367. And you think that by that means the health of the miners might be improved?—I am sure of it.

5368. Do you not think that if the captains had a better education, it would be advisable, so as to know something about ventilation, beyond the mere driving of an end?—No; I do not think that education would assist them there. Education is a very good thing, I am sorry that I lack it. I never had any since I was six years of age, and I should be glad if I had a little more, but I do not think that it would have made me a better mechanic than I am now. (C.) *Ventilation.*

5369. If the captains knew the evils attendant on bad ventilation, do you not think that they would be more ready to adopt means to improve it?—No; I do not think that education would give them anything more like a human feeling.

5370. (*Mr. Fulke Egerton.*) You think that they know that the air is dangerous?—Yes; they know it.

5371. (*Chairman.*) I suppose being strong men themselves, and not having suffered, they think that others will not suffer?—Sometimes, for the sake of the expense perhaps, they will hesitate, and sometimes men will go on themselves and the candle will burn tolerably well; but then the air is not so good as it might be, and it could be made better, and if men do not complain the captains do not give it the consideration which they should do.

5372. If men complain, do you think that the captains always provide means?—I should expect that they would; but in many cases there is poor air and the captains know it, and it is not remedied as it should be.

5373. And you know that of your own personal knowledge?—I know that that is the case.

5374. You have examined different mines?—I am called on frequently to inspect mines.

5375. And you have found that to be the case on inspection?—I have found that to be the case. I have very often said to captains, "I should put in some fan or some pipes, or do something to convey air to the men." They say that the air is good; that it is not so very bad. I say, "You must have it bye and bye, and why not have it directly?" Then it goes on still in that way, it is not done as it should be. These are the facts, and the miners suffer from it, and I have been long arguing or contending with parties that it should be done.

5376. And yet you know many cases where they have not adopted it after you have spoken to them?—Yes.

5337. (*Mr. F. Egerton.*) Do you know any places where men are driving in poor air?—Yes, I frequently observe it in inspecting mines where men are 30, 40, or 50 fathoms off, and a little fan might give them a fresh supply of air.

5338. And yet that is not provided for them?—It is not provided for them one time out of ten; there are some agents more particular than others, but generally speaking it is neglected.

5339. Do you know of any instances in which, if the men had applied to those agents they would have allowed a fan?—I do not know that they have made any direct denial of those things; but men cannot say we will have a machine here. It is the agents' place to say that they will do it.

5340. Are there mines working in which there are none of these small machines?—Yes, many mines in the county.

5341. So that if a man applied for them he could not get them at once?—No. I do not know that I have heard tell of any flat denial to the men.

5342. But if they were none in the mine then they could not be applied?—No, by no means.

5343. How long do you suppose a man could work in poor air?—The general hours in the county are eight, but in some deep mines they work six.

5344. How long can a man work in poor air, how many hours consecutively?—He ought not to work four hours.

5345. Do you suppose that they do work four hours sometimes?—Yes, and eight very often.

5346. In poor air?—Yes; they ought not to be there more than four hours.

5347. But do they work eight hours continuously in poor air?—Perhaps at their shift time they might remain idle for half an hour, or something like that, to cool, and very often when they come away from their mine they blast a hole, then they cannot go in there again perhaps for half an hour, and then they just lie in a place idle for half an hour for the smoke to clear away, whereas if they had a little fan they might blow

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in a little fresh air as well as being back in a current doing nothing.

5348. So that it is a loss both for the men themselves and for the adventurers?—Yes; I have been long urging that. I have never let men work under my guidance, for many years, in poor air, unless they were trying to hole or to communicate air to another place. I have said, if there is poor air I will have a fan or a water fall, or some appliances.

5349. But that is not the general practice?—No; or at least it is not general enough; a great deal of the poor air might be avoided with a little attention being paid to it

5350. Are there cases where you think that it could not be avoided?—No place. If you have a fresh current of air you can always take it up from that place.

5351. And therefore it is neglect?—It is neglected too often, I am sorry to say.

5352. Do you think that the men suffer in health from that?—They must suffer in health when they are breathing such a bad atmosphere. You hear men complaining very often when they are climbing the ladders; they know when they are working in poor air, they feel a weakness in their legs. I have not experienced it myself. I have generally worked in good air places upon tribute.

5353. Do the men go back again the next day to the same place when they find that the air is poor?—Yes; in most of our mines we keep three shifts of men, and they will relieve each other, and they may have half an hour before their relief time.

5354. Supposing a shift of men found the air bad, would they go on with the work for the whole month for which they had taken it?—Yes; very often, when men are in such a place they are reluctant to be out of employment, and they work and injure their health, and it goes on for years imperceptibly, perhaps, till it tells upon the constitution.

5420. (*Mr. Kendall.*) And did it then fall into other hands?—I was there as long as it was worked;, till it was abandoned

5421 Where did you go then?—I had the Great Crinnis mine at the same time.

5422. Did that also pass into other hands?—Yes.

5423. With regard to ventilation, where there is defective ventilation, does that occur more in small and new mines, or in large mines?—I do not know; it varies very much.

5424. Have you been called in lately to see any extensive mine, to report on it?—No, not for the last two or three months.

3425. Have you, within the last year, seen any old workings?—Yes, many times.

5426. Do you think that it is more frequent in old mines?—Yes.

5427. In old mines is there much decayed material—much decayed wood, or anything of that kind?—Yes, I have known several mines where the wood has been decayed, and the atmosphere there has been very bad indeed. I think that all the dry levels should be pitched or tarred underground It would be worth while to do so for the preservation of the timber, and I do not think that then that matter would issue from it.

5428. In any of the mines which you have visited do they use air sollars?—Yes; that is frequently done.

5436. Where has the ventilation been bad which you have inspected?—In most mines that I have inspected, when the ventilation has not been generally bad throughout, there have been ends driving or winzes sinking where the air has been very bad in many points.

5437. Can you state a case, without mentioning the mine, where there has been bad ventilation?—It has come under my observation several times, and I do not know any particular place.

5438. Will you state some mine, at some depth, where there has been the driving of an end, within the last two or three years, which you have been called in to inspect?—There is a mine which I have inspected for the last 20 years. I have observed that there have been ends or distant points where men have been working in such air as I have been speaking of. I have observed it many times in that period, and in my own mines I know that it is the case if I do not apply some machine.

5439. Take the last four or five years. Will you state one or two of the worst cases where you have remonstrated, and have said that the men were working in very impure air?—In almost every mine, if the levels are about 20 or 30 fathoms from the shaft, I always observe that the air is not fit for the men to work in.

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5440. Have you observed that more in small mines or in large mines?—It is possible to have the air as bad in a shallow mine, not more than five fathoms deep, as it is at 100, or 130, or 140 fathoms.

5441. Have you observed it most in those small mines or in the large and deep mines?—In both. I always observe, that when the end or gallery is 20, 30, or 10 fathoms off, the air is very close and very impure. Men must keep their candles down flat for them to burn, and I have seen men working when the grease has been running down from the wick.

5480. (*Mr. A. Bruce.*) Do you consider that at 30 fathoms from a winze, the air can be sufficiently good for a man to work in, without any artificial ventilation?—I think that it should be improved if above 20 fathoms. Men may work at 40 fathoms.

5481. Have you ever known an instance in which a close end was worked at 30 fathoms from the shaft or winze without some stagnation of air?—Yes, I have known levels more than 30 fathoms from any current of air, and a candle would burn well; but when the men blasted, the dense smoke would lie where it was until they made another blast, and the place has been quite full of smoke from one end of the corps to the other, when the candles would burn moderately. Even then, I think that the air is too bad for the men to breathe, if it can be improved.

5482. Do you think that any place in which the powder smoke remains half an hour can be a proper place for a man to work in?—No; he ought not to do so.

5483. Is it common for close ends to be driven 30 fathoms from a supply of ventilation without any artificial ventilation?—It is very often the case.

5484. Am I to understand it to be your opinion that in all those cases artificial ventilation ought to be supplied?—Yes, it would improve it.

5485. And that a man's health must suffer sooner or later from continuing to work in the air of such a close end?—Yes; if an end is 20 fathoms off and a little fan machine were put in, and three boys were employed to drive that fan, I believe that the men in the end would do more extra work than would maintain those three boys, beside the value of their health.

Mr. William Petherick.

5554. (*Mr. Kendall.*) How deep was that mine when you left it?—She was in 1834, I think, 140 fathoms.

5556. During the years that you were there was the ventilation generally good or bad?—It was always very good, except in a little way from the ends where the winzes were not communicated.

5557. How far used you to drive before you communicated with the winzes?—Perhaps about 30 fathoms.

5558. Have you known bad air there?—I have known bad air there occasionally for days.

5559. Did you ever see any difficulty as to the burning of candles?—Sometimes, but not very often.

5560. Were you obliged to put the candles in an inclined position to make them burn?—Yes, occasionally, in the close ends.

5561. To the best of your recollection, how many close ends at one time were they obliged to work in that way?—Perhaps five or six.

5562. In those cases the men, I suppose, suffered?—Yes, some little; sometimes it was owing to the stuff not being taken away.

5563. There was so much stuff in the end that they were overcrowded by it?—Yes, it was so, sometimes, and very often that occasioned a close atmosphere.

5598. (*Chairman.*) Has the longest time you have ever known the men driving in an end before the winze was opened been three months?—Yes; in inferior air.

5599. Have they never driven more than three months in inferior air?—Not on veins. I am speaking generally. There might have been one case in a year. I was there for 17 years.

5600. During that time was there only one case within your knowledge?—They have never been more than three months working in bad air.

5601. During the whole of those 17 years?—Yes; at a time.

5602. (*Mr. Kendall.*) How happened it that they were for so long a time as three mouths?—Sometimes the stuff could not be brought away from long dis-

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tances; a great distance from the winze would be another cause.

5603. In driving an end, or in driving before a winze has been opened, the men have never driven for more than three months?—They may not drive for three months in bad air; not for more than a month.

5604. But never for more than three months?—Not to my knowledge.

5605. (*Mr. Austin Bruce.*) How soon do you think that the air becomes bad after the miners get into a close end?—It may be a month or two.

5606. After driving for a month or two?—Yes.

5607. How do you judge of the presence of bad air?—We can tell by the state of the candles.

5608. Have you anything else to judge by?—Our feelings.

5609. Does the unpleasant feeling begin some time before the candle shows any sign?—I think not.

5610. Do you think, therefore, that the men may work healthfully in a close end up to the time that the candle begins to fail in its light?—A man may so work for a short time.

5611. But would you say that he might work up to that time, or do you think that a man could work, even for one week continuously, as a miner works, in close air, without being, in the long run, the worse for it?—He would not feel a great deal of it in a week, he would in a month.

5612. At the end of a month he would feel probably rather weak, as compared with what he was at the beginning of the month?—Certainly.

5613. But without feeling either weak or ill, do you suppose that a man can frequently work in bad air without its affecting his constitution?—Certainly not; he must feel it

5614. Is not that the probable cause of the shorter life which is generally attributed to the miner?—No. I think the climbing and the bad accommodations are another great cause.

5615. Do not you suppose that the effect of climbing is much more marked and severe upon the man who has been working in tainted air?—He would feel it rather more.

5616. Suppose that the powder smoke were to remain, after the shot has been fired, for half an hour in a close end, should you consider that a proper condition of the atmosphere for the men to work in?—No.

5617. Does it not frequently happen that the men do work in close ends in which the powder smoke remains for half an hour?—Not frequently.

5618. But does it not occasionally happen?—Yes, unavoidably.

5619. You mean unavoidably, I suppose, unless artificial means of ventilation are introduced?—You cannot drive a level beyond a winze but what you begin to feel the want of ventilation a little.

5620. In that case, the want of natural ventilation, I suppose, can always be supplied by artificial ventilation?—It is supplied in many cases, wherever it is wanted.

5621. Then will you explain your meaning in using the expression "unavoidably"?—You cannot always at first apply artificial means.

5622. You have spoken of what you suffered in climbing?—Yes.

5642. (*Mr. Kendall.*) Can you explain to the Commissioners why, in working through different strata in different localities, the air is, sometimes, in an end, ten fathoms off from a winze, twice as bad as in other localities 30 fathoms distant?—They always vary.

5643. So that you never exactly know how far it is necessary to make your artificial means of ventilation extend, judging by the candle, according to your present practice?—No.

Capt. Thomas Taylor.

5668. (*Chairman.*) How many shafts have you?—Four.

5669 Is there one up-cast and one down-cast particularly?—Yes.

5670. Do they change at all?—Sometimes they change; it depends upon the way of the wind. If the wind is from the east, it blows down through this shaft (*pointing to a plan*), and if it is the other way, it goes the other way and comes up through the other shaft. But that current is only as far as the 40 fathoms; below that it is always in one way.

5671. Which shaft is the up-cast from below that?—The engine shaft; the lower one. Then it comes up, and there is a cross-cut; then it changes as the wind changes. (C.) *Ventilation.*

5672. But below the 40 fathoms it is always the same?—Yes.

5766. (*Mr. Kendall.*) When you worked in those places, in bad air to which you have referred, would it, according to your opinion now, have been more economical if the agent had employed some artificial means to supply pure air?—Yes, I think so. If they had continued that end, they would have been forced to do so, I think; but it was stopped.

5767. Were not some artificial means due to the men before you stopped?—I do not know. It was not what you would term a very bad air, but yet it was getting quite bad enough to have an air machine put in.

5768. And it would have been necessary, if you had proceeded with it?—Yes; and for aught I know the agent meant to have an air machine put in.

5769. Generally speaking, do agents, as a matter of economy, use artificial means when they find that the air is bad?—I should think so. They ought to do so for the good of the adventurers as well as for the health of the men.

5770. You have seen a good deal of mines in one place and another, did you ever know an agent refuse to use artificial means after an application was made to him, and he was satisfied that there was bad air?—I do not know that I can state a case.

5771. In your experience, do you know any cases of gross neglect, where the agents, for the sake of the men and for the sake of the adventurers, ought to have forced in air by artificial means, but did not do so?—No; I do not.

5772. (*Mr. Holland.*) Do you not know many cases where the men think that there should be fresh air and the agents do not?—That may be the case.

5773. Very frequently?—Not very frequently.

5774. (*Mr. Austin Bruce.*) Your father was a captain early in life, I dare say?—Yes, when he was about 23 or 24.

5793. (*Mr. Holland.*) You stated that the air was bad, but not very bad, in which you had worked?—Yes.

5794. Do you mean that a candle would burn in it?—Yes.

5795. You call it bad, then, before the candle gets dim?—I call it very bad before it will put out a candle.

5796. But before it gets dim; before you have to slope it, in order to make burn?—Yes, it is bad then.

5797. Very bad?—Yes.

Mr. John Borlase.

6223. (*Chairman.*) But you said that there was a great deal of difficulty there?—Yes; we have a place here now, but it is unavoidable, we cannot help ourselves; circumstances, as the old man said, alter cases; we do not wish the men to stop down more than three hours.

6224. At what level is that?—At the adit level.

6225. You say that the men there can only work three hours?—They can work longer, but we do not request them to do so; we have been down there ourselves, and find that we cannot keep ourselves in it, and we are putting in air collars to avoid the inconvenience; we have only one man there in 24 hours, so that the place has a long time to cool itself, and the air becomes pure.

6226. Are you putting in one of your air machines there?—We are putting in an air collar.

6227. (*Mr. Davey.*) How far is that from any shaft?—It is only about 50 fathoms from the shaft to the Callington mines: it is in an adit level.

6228. (*Chairman.*) How long have you been at work there?—Only a week, so that it is a mere nothing.

6229. Still you think that there are other mines where there might have been a great difficulty?—There might have been, but it has not come under my notice.

6230 From your great experience in working as a miner should you not think that there is in any mine an end where there is great difficulty in ventilating it?—In Trenow Consols I have worked somewhere about 10 years ago; we had a level there, and we had no opportunity of getting up and down in it because it is under the sea, and there I went down and put air collors; it was 150 fathoms from the shaft, and after putting in the

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(C.) *Ventilation.*

air sollars we had very good air, but the air was dead before that.

6231. From your experience it is your opinion that all ends, however poor or hot the air is, can be ventilated?—I think that there are means to be used.

6232. Then you would think that where means are not used they ought to be?—Yes.

6233. And whose blame is it if they are not used?—It is the agent's blame, I should say; I should take the blame to myself.

6234. (*Mr. Davey.*) Did I rightly understand you to say that this adit level has only been working for one week?—Not more than about a week.

6235. And in that time you are putting in sollars?—Yes.

6236. (*Mr. Kendall.*) In the meantime one man is there in a day?—Yes.

6237. How long do you think it will be before you will get the sollars in?—He is putting in the sollars with him.

6238. (*Mr. Davey.*) He is not working in the end?—No; there is a shaft down 40 fathoms, and we have been down the shaft, and there are about two fathoms of water in; we have gone back to the adit to clear the tail of the adit.

6239. (*Mr Kendall.*) And you are carrying in air sollars?—Yes, and removing the rubbish back upon the air sollars and getting a draught to follow the men.

6240. Then you are not actually working in the end yet?—No.

6241. But you are taking the very best means that you can to get pure air for the men?—Yes, we are taking the very best means that can be adopted for the ventilation; the men are taking the air in with them.

Capt. R. Dunstan.

6248. (*Chairman.*) On the day to which you have referred you went down that mine, will you state to the Commission the condition as to ventilation in which you found that mine?—I will state the fact and you must judge as to the ventilation; there did not appear to be any want of ventilation, there was a very good current of air in the level above.

6249. Will you state the level?—It would apply in the same way to all levels under the same circumstances; this was the 70 fathoms level. We were sinking a winze in the bottom of the 70 fathoms level. The winze had been sunk three fathoms, but the men had been keeping holiday during the Easter week. I did not know that they had been keeping holiday. I went hastily down the winze, and found that my candle became extinct in a moment. It nearly cost me my life; I had a very narrow escape of my life. We miners call it a damp. The damp had been formed during the absence of the men. There was no fault in the ventilation of the mine, because there was a fine current of air. It was between two draughts that the winze was sinking; there could not be any fault in the ventilation of the mine. How to account for the formation of the damp is beyond my skill.

6250. How did you go down?—By a rope, as we ordinarily do.

6251. (*Mr. St. Aubyn.*) Down a winze?—Yes.

6252. (*Chairman.*) What other men were there with you in the mine at the time?—The captain of the mine was there and the miner who worked in the winze; but they were in the level, not down with me. I was the only one down in the winze.

6253. How far did you go down? Did you go down to the bottom as far as they had sunk?—Yes; I went down 18 feet only; that was the depth of the winze at that time.

6254. You landed at the bottom?—Yes.

6255. How long were you there?—Not a minute. I found my life going; of course I could not stay there. The candle became extinct when I got about eight feet under the brace, *i. e.* below the level; but I do not think that I was there two minutes.

6256. The candle went out before you got to the bottom?—Yes; the candle went out as soon as I touched the damp, of course; it acts upon the candle like water would.

6257. Had you any feeling as you were going down?—There was not time to tell. As soon as I got to the bottom I found my senses going away.

6258. How did you give notice to the man?—I knew what it was immediatelely, and I said "Pull me up."

6259. And they wound the rope up?—Yes. The captain took me by the collar and landed me on the brace.

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6260. Did you lose your consciousness?—No, I never lost my consciousness; the time was too short.

6261. When you came to the level, what did you do?—I lay on the level a little while, and then they raised me up, and moved me forwards and backwards, and so on. It occurred to me that I had lost circulation for some time.

6266. Is the candle the criterion for both poor air and damp?—No, a man can live when the candle will not burn. I have many times myself, in my experience, lived where the candle would not burn; but the effect of the damp, that is the carbonic acid gas, is beyond question to extinguish the candle instantly; it does not extinguish life quite so instantly, because in the air cells we retain a portion of life of course, and it must kill that life first. The candle is not the only criterion; poor air has a very bad smell with it, which is very injurious to the miner.

6267. In your opinion, if the men had been working there that damp would not have accumulated?—No, of course not.

6276. In your opinion, if, instead of thus sinking a winze, it had been a rise, would the air have ascended?—No, it is just the same.

6280. As I understand you, in Huel Emma you were in a drift where there was a pure current of air?—Yes.

6281. But in sinking a winze below that about 18 feet, during the absence of some men, there was an accumulation of what you conceive to be carbonic acid gas?—Yes.

6283. Were you sick after you came up from that winze into the level in Huel Emma?—I was sick after I got into the level, and it relieved me.

6284. (*Mr. Davey.*) You have said that you have never seen an instance of it to the same extent before?—I have not.

6286. You went down before the other agent to inspect the mine?—Yes, he was with me as far as the level. I was putting prices on the work. I have seen damps, but we can generally see them with the eye, and then we do not go down into them; we send down a candle.

6287. How do you manage to see it; in what peculiar way does it show itself?—It would form like a film or a fog; you could see it like a white hoar fog.

6263. Is that called poor air?—That is called a damp. It may be the same in kind, but different in degree; this is the extreme degree.

6264. How would you distinguish one from the other?—I could live in poor air but I could not live in a damp.

6265. How would you describe the difference?—It may be hard to describe it; the damp has lost all vitality. The poor air may retain a portion of vitality, so that a man may live.

6268. What would have prevented its accumulating?—The circulation.

6274. Where were the others that you have been in where the air has been poor?—In Cornwall. The air is always bad in mines, more or less; it depends upon the ventilation.

6275. I suppose you mean in close ends, or winzes, or rises, or do you mean in all parts?—The bad air is not confined to close ends; what I have stated is a sample of it, because here was a small winze sinking only three fathoms under a current of air, and the air does not go down; the same air is at the back and the bottom. There is more bad air in general than people account for, in consequence of air not rising or falling into the places where the men are working.

6277. Have you ever turned your attention to any remedy for that peculiar state of things?—We remedy it—we cause a circulation; that is the way in which we remedy it.

6278. (*Mr. Kendall.*) Do you fancy that the same kind of air as you speak of now would form in the back of a rise as it would down below?—Just the same. I have experienced as bad air in rising as in sinking.

6279. Did you ever experience the same deadly feeling as you experienced in Huel Emma?—Not to the same extent. In Fowey Consols I once experienced a very queer sensation in bad air.

6282. The only thing that I am rather puzzed at is your fancying that the same gas would form in the back;

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Ventila-

you think it would?—Yes; I have experienced very bad air in backs. I have seen backs in which I could not carry a light.

6285. (*Mr. Davey.*) Have you seen anything like that damp in any other mine?—Yes; I have seen damps, but I was never down in them I was caught here because I did not expect it.

6288. It is not very common to meet with those damps underground, is it?—Yes it is. I have seen many of them; I was never in one before.

6289. You say that you never saw one in a rise?—I have been in rises where I could not carry a light up. What may have been above it I cannot tell. I was never caught before as I was in this instance.

6290. You say that you could work where a candle would not burn?—Yes; I have found many places where a candle has been obliged to be stuck some feet behind me.

6297. (*Mr. Holland.*) Do you think that there has been much exaggeration about the badness of air?—I do not know what has been said about it.

6298. Have you heard much about it?—The question has not been discussed. We miners know what bad air there is. I do not know what may have been said about it in other places. There is a great deal of bad air in mines.

6299. Is it very frequent?—Yes.

6300. In almost all mines?—In all mines more or less.

Mr. Richard Quiller Couch.

6459. (*Mr. Kendall.*) Can you suggest any other causes which think affect their health?—The first is, I think, a want of ventilation below the surface; that I think lays the foundation for all the mischief. That is why I think that the men, apparently in the enjoyment of good health, become blanched, their skin becomes sallow, and frequently assumes that kind of appearance which Dr Addison calls the bronzing of the skin; and on examination, in several cases in which they have sustained injuries to the hand from jammings, I have placed the blood under a microscope, and I have found that the red corpuscles are very pale, and very much shrivelled, showing a deficiency of blood power. That is before they give any indications of disease, or before they complain.

6460. Would that arise as much from bad ventilation in their dwellings as from climbing, or from the perspiration being checked, because there were not proper drys for them to go to?—I put it down principally to their working at deep levels with bad ventilation, and for this reason I find that the engine-men, and those who work at the surface, and whose mode of life otherwise is of the same character, do not suffer from the same diseases.

6463. Is the natural ventilation fairly good in the mines which you have seen?—There is no system of ventilation in any mine I have seen. Where there are many shafts, the ventilation is very good, except in "ends" or backs of levels and winzes, as well as cross cuts. In Bottallack, which is worked under the sea, there is a diagonal shaft going to the bottom. By this means, the ventilation is much better than before. But it is impossible thoroughly to air all places so situated. In one mine where there was only one shaft a few years since, the ventilation was dreadful, and all the men had failing breath, and on going to other and colder mines died from pneumonia and phthisis.

6464. How did you ascertain that the ventilation in that mine was bad?—I first inquired of the men, and took their accounts when they came to consult me, without any reference to any inquiry afterwards; and they invariably described the ventilation as being excessively bad, as judged by their own standard of the "candles would not burn." This mine was unfairly bad.

6470. (*Chairman.*) Do you consider it your duty to inquire into the state of a mine?—When I find that there is much disease in it I do; and I must say that the captains are always willing and anxious to remedy any defect when it is mentioned to them.

6486. (*Mr. St. Aubyn.*) Do you not think that any system by which climbing from great depths could be avoided would materially improve the condition of the miners?—Yes; and I may mention a case that occurred only a day or two since. A man was working in Wheal Reeth in a very close end, and disease of the chest was coming on. He went to work and was put in another place where he was lifted by a man-engine, and he recovered, I should think, in less than a third of the time that other men labouring under the same disease would have recovered in. They were ascending to another shaft. I find that continually the case where the man-engine is employed, the men do not suffer so much, and they recover more quickly than they do when they have ladders to ascend.

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Capt. Richard Boyns.

6709. (*Chairman.*) If it changes, and there is no regular up-cast, does that air circulate constantly through your cross-cuts and your winzes without coming up at all to the surface; may not that be the case?—I should fancy that it came up. Where we have so many cross-cuts it must get up in some way or other. I can hardly see how it can come up where there are very few shafts in a mine; I think that it would die away.

6714. How do you judge as to being able to drive further or not?—The burning of the candles is one test.

6715. Have you any other test?—We find that we cannot breathe very well when we get into bad air.

6716. You have no test but the burning of the candles or the feelings of the men?—We are governed generally by these.

6717. Do you ever try whether the draught ascends or descends the winze nearest the level; whether the draught is up or down the winze which communicates with the level in which you are working?—I think that it is up in most cases. I am not prepared to answer that question with confidence, but I think that the draught would pass up.

6718. You have not tested it?—No.

6805. (*Mr. Kendall.*) Do you not think that sometimes in this county there is false economy in not having cross-cuts?—Yes, I am quite satisfied in my own mind that it is very bad mining indeed when cross cutting is neglected. With good ventilation the men can do 50 per cent. better labour.

Mr. John Nankervis.

7221. (*Chairman.*) How do you know when it becomes necessary to do that?—By practice and being trained up to it, as the men get into work they know the heat, and they judge by the light of the candles as well; they feel the perspiration coming on, and they understand it by practice.

7222. They judge by the candle when it will not burn well?—Yes; when it will not burn freely.

7295. (*Mr. Holland.*) Can you keep the air cool to a distance of 60 or 70 fathoms?—Not in places to work all the time; in those places we generally calculate to work for 6 or 12 hours out of the 24; for the rest of the time it is left to cool. If we wanted to work longer time we should very likely have to apply the machine and to sink winzes if we could.

Mr. Henry Boyns.

7328. (*Chairman.*) Suppose you were driving away from a shaft or a winze 50 fathoms, should you consider that far enough?—Yes.

7329. It must be close there, must it not?—Yes; but it depends upon circumstances. If we work only one pair a day it makes it much more acceptable to work in; if we have three pairs of men a day at work it is necessary that something better should be done.

7330. Do they work 6 or 8 hours a day?—They work 7 hours a day, but there is no blasting goes on then; a man can leave, and he is not affected in any degree whatever.

7331. How long is it before the smoke gets out of that sort of end?—Three hours perhaps.

7332. You can only work one pair of men a day?—In following that rule we can drive our ends further without ventilation, not doing injury to any person.

7333. When you have foul air the men do not drive so fast?—No; if a mine does not need forcing we can take a longer time about it, and do it cheaper; we can do it more effectually, and at less expense, but if we must force it we must put in superficial means of forcing the air, then we save the expense of sinking winzes, and the men are better off even then.

7419. (*Mr. St. Aubyn.*) In the new mines you think there is more risk of the men suffering?—Yes.

(C.)—VENTILATION.

(C.) Ventilation.

7420. From want of ventilation?—Yes. The difficulty is, when we sink the first shaft, to get air down any considerable depth without superficial means to force it till we communicate with another shaft. I recollect working in the dark in order to get a communication.

Capt. Stephen Harvey James.

7464. (*Chairman.*) Does the draught come down?—Sometimes it comes down and sometimes it goes up; but it will depend upon the wind at the surface.

7468. In a well managed mine?—Almost in every mine; it is always done with us, perhaps there are some omissions. Some people, I fear, are not so careful about things as they ought to be.

7553. (*Mr. Kendall.*) Although the circulation may vary according to the wind, and although the draught may on one day go up and on another day go down, still at the same time, is there not a general circulation?—Yes, there is sure to be, if you take the means to do it

7554. The foul air does not remain in the mine, it gets out somehow?—Yes, most certainly.

7556. Although there may be a variation in the mode of circulation, yet your idea is that there is sufficient ventilation to take the foul air out in a short space of time?—Yes, most certainly. You will sometimes find it in such a state that you can hardly see the candle.

7565. (*Mr. Davey.*) And that the men are not away from the surface above seven hours, and are not working above five hours?—I do not think they are.

7566. Consequently your levels must be 19 hours out of the 24 unoccupied?—I should think that for 18 hours out of the 24 they are unoccupied altogether as an average.

7586. You say that the foul air finds its way out of the mine, how long do you suppose from your lowest level the foul air would be finding its way out of the mine?—A very short time indeed, I should say.

7587. Have you ever made any experiment?—No, we have never been called upon. It will depend upon circumstances. In the lower part of the mine, if the wind shifts and gets over the land, and is very light, you will find that the air will be close down in the mine, whereas if he gets out to the southward, or west, or northwest, it is otherwise.

Capt. William Stevens.

8125. (*Chairman*). Have you any hot levels?—Yes, we have them pretty hot. Ours is the deepest mine in the district, and we have some places distant from ventilation where it is hot.

8126. Have you ever tested the heat at all there?—Yes.

8127. What is the greatest heat?—From 85 to 90 degrees

8128. That is when working at a close end away from ventilation?—Yes.

8129. Do you provide any artificial means of ventilation?—Yes.

8130. Will you describe what those means are?—If we have 15 or 20 fathoms from one ventilation to another, we put down a winze from one level to the other, so that the men shall have proper ventilation.

8131. Have you any artificial way of blowing air in?—No; we have three working shafts in our mine, and in the western shaft the air goes down, and it goes through the mine and comes up the eastern shaft.

Capt. Matthew Curnow.

8575. (*Chairman.*) What are the means that are now used for ventilation?—Cutting open more ground.

8576. Do you mean that the more the mines are extended the better the ventilation is?—Yes; the more it is cut up and opened.

Capt Charles Thomas.

8695. (*Chairman.*) Do you think that the winzes and cross-cuts and shafts are sufficient to ensure sufficient ventilation?—Fair ventilation of that kind, so that there is no difficulty in burning a candle at all; every candle in every part of the mine will burn perfectly upright without any difficulty. If we found it required that the candle should be turned aside to burn freely, we should at once devise some artificial means to convey air for he men to work in.

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8696. The candle is the only means that you have of judging of the state of the air?—Yes.

8697. Do the men never complain of the state of the air before the candle will not burn freely?—I never heard of it in a single instance that I remember.

8720. In any of these mines with which you are connected, what is the longest time that the smoke takes to clear away from a close end after blasting?—It is a considerable time before the whole of it would be driven off or moved off, but, generally speaking, with very few exceptions, in the mines I am connected with, the smoke would move off, or would be so far passed away as to enable the men to work with a little inconvenience, perhaps in ten minutes; sometimes they may have to wait for a quarter of an hour before they could go to work again comfortably, not longer than five minutes in some places, and in some other places not more than two minutes. We do not let the men go into an end if we can help it until the smoke is partly passed away, but they will rush in, and we always think there is some risk connected with their going in soon after the blasting of the gunpowder

8866 (*Mr. Kendall.*) Referring to all the mines of which you have the management, I understand from you that generally speaking the ventilation is good in them?—Yes.

8868. As I understand your evidence, although much greater care is now taken of the miners, still a love of economy does sometimes so far prevail that in order to save a little money you do not set the fan machine to work so soon as you otherwise might?—It is partly that The men say "We can work here very well;" and when we find that the candle burns very well, we do not act so soon as we ought to do.

8869. If you were generally more attentive, you think that you could, with the appliances at your command, send in quite air enough to the men, and make the mine healthy for the men to work in?—Yes.

Capt. Thomas Richards.

8967. (*Chairman.*) In a close end where there is poor air, what means do you adopt generally for the purpose of supplying fresh air?—That depends upon circumstances; if it is near an engine shaft we should force force air in by a machine from the engine, but if we could get water we should prefer a waterfall; if we cannot get either, we must have a fan-engine.

8968. And have it worked by a boy?—Yes, or by a water wheel sometimes. We work the fan-engines with a little water wheel, and they answer very well.

8969. How do you judge when the air is poor, and it becomes necessary to use artificial means?—More from the candle and from one's own sensations than anything else. You find sometimes that certain gases will hang about the bottom of a level, and a man becomes weakened; he feels it.

8970. Do you know anything about cold damp?—Yes. There are certain rocks that will give out more cold damp than others; there are some rocks that it is peculiar to, although the air seems fair enough for a candle, yet it is bad for the constitution.

8971. Have any means been adopted for the purpose of ascertaining the state of the air?—I have never seen any machine that has been used to ascertain the impurity of the air.

8972. (*Mr. Holland.*) Can you point out some places in mines where that cold damp exists?—It arises more from the soft porphyry or decomposed granite; that is just the same kind of ground as would decay some wood rapidly.

8873. Is it equally bad in dry as in wet mines?—If you have got a large quantity of water, the water would drive out the air.

8974. You stated just now that there was some air that was injurious to the miners, but in which a candle would burn; could you point out those spots?—Yes; where there is a soft decomposed granite and porphory it has more that effect than in other rocks that I have met with.

8984. (*Mr. St. Aubyn.*) With regard to ventilation, are you of opinion that a great proportion of miners' disease arises from bad ventilation?—I think that more of it arises from climbing; but there are some mines in which, although they are very well fit to work in, as far as the ventilation goes, there is no natural current. It is an unnatural atmosphere: for instance, you may stand on the surface at the edge of a shaft, and you will

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find that there is a nasty vapour that comes up, which you would not like to work in, but when you are underground you must work in that air, and that arises from not having the shafts frequent enough.

8985. Can you state to the Commissioners in a few words what, in your opinion, are the best mechanical means of improving the ventilation in the Cornish mines?—That is a very difficult question to answer. The difficulty is to convey the air; but there are many means that might be employed in ever so awkward circumstances. I think that if you have to force air in a distance, if you send it in by a pipe, that the area of your pipe should be in proportion to the length. For instance, it should be more in the cornucopian form; when you commence it should be large, gradually becoming smaller. If you take and use a four-inch pipe and you force air in for 100 fathoms, you may burst the pipe; the air has no disposition to go on, and it becomes a fixed body, or it comes back again. The general working of the air in the Cornish mines is very little known compared with the collieries, because they have perhaps only one or two shafts; but they may have workings two miles off, and yet have a fair supply of air, while there is a large amount of gas arising.

9008. (*Mr. Davey.*) I suppose that you have tried many experiments as to the best mode of ventilation?—Yes, a good many.

9009. Did you ever try drawing you the foul air instead of forcing in air?—I have tried both with a double set of pipes.

9010. Which do you think is the best?—I generally make it a rule to take up my air in a good place. Say, for instance, that I was going to drive a 100 fathom level, I should not go out to the 100 for the air. I would go to the 70, or 80, or 90. I would take up my air where it is good, and send it on; it is of no use to take the old air again. I have used lime (which I have found a very good thing) in the mouth of the pipe to improve the air.

9011. You have not mentioned about withdrawing the foul air, how did it answer?—It is a very good plan. I like extracting the foul air, but then I would never take up the warm air to send it back again.

9012. How did you manage to extract the foul air?—Simply by a pump from the engine worked by a rod. We have a double machine at Treloweth, for instance, a 30-inch cylinder, with a piston, and there is a top and bottom valve.

Capt. Joseph Vivian, North Roskear.

9107. (*Mr. St. Aubyn.*) Do you think that the mines are as well ventilated as they could be?—All the mines that I am acquainted with are well ventilated, and so are all the mines about here, I should say for a certainty, for miles and miles, and, as far as I know, farther. I think that the Cornish agents have studied the ventilation of mines almost as much as anything connected with it. You will now find that 200 or 300 fathoms deep in the North Roskear mine the air is as good and as pure as it is in this room. We throw it down. We find that one shaft serves for the down-draught and another for the up-draught. Of course, when you get deeper you will get hotter as you get in, and some of the men in deep levels will have to work in hot places, and sometimes, rising against a shaft, those places will of necessity for a few months be warm and not so healthy as airy places.

9108. Could you suggest any mechanical contrivances for making the ventilation better than it is now?—I do not know that we could. In our mine at South Condurrow, where we have only one shaft, a pitman came down to me the day before yesterday, and said, "The "air at the bottom has got uncommonly fine, and I "think it is bad." I said, "You have a large bellows "and a pipe and everything to it. In how long could "you do it?" He said, "I could do it in two days." It is now working and sending down a stream of pure air. If we can command a draught we do so, and if not we use the bellows or a fall of water.

Mr. Robert Hart Pike.

9167. (*Chairman.*) Have you any experience, from your knowledge of mines, as to the men suffering from any want of ventilation?—It sometimes happens that when it is necessary to communicate from one point to another, for the purpose of ventilation, the miners have to work in a very close place and bad air, in which it is hard to keep a candle burning, and a difficulty in breathing is experienced.

9168. Then if any additional means could be adopted while that necessary operation is going on of supplying fresh air, it would be very desirable?—It is done if the cross-cut or communication to be made is an extensive one, or if there is a great deal of ground to open, then, of course, they introduce artificial means by pumping air, that may be done to a great extent, but if they are driving for merely a few weeks or a month they get on without it. The men bore the ground for blasting, and when they set fire to the fuze, they leave their work, and perhaps it would take several hours before they could return to the place, on account of the smoke.

9169. And I suppose they are paid more?—Yes; I do not mean to say that the men get higher wages, but they work fewer hours, and the wages must of course be made up to them.

Capt. John Daw.

9256. (*Chairman.*) You consider that when once you have sunk a winze, the ventilation is good?—We have then plenty of ventilation.

9260. Does it ever happen to you that the candles will not burn?—We never like to put a man where the candles will not burn.

9261. Does it never happen that the air is so close that the candle will not burn?—It may sometimes, it will depend a good deal upon which way the wind is blowing. We do not allow men to work unless there is air for them to work in.

9262. Still the ventilation somewhat depends upon the way that the wind is?—Yes. I was in a mine last week where they had very good air except when the wind was blowing from the south.

9263. What mine was it?—Wheal Uny; there they had not the air so well last week as they had it before. That was owing to the wind.

9264. In what district is that?—It is very near Redruth Church, it is in Redruth parish; but we have no difficulty in the men working if we do not go more than 30 fathoms from winze to winze; there is plenty of air.

9266. When it goes up what is the effect at the far end of the level?—We do not find much difference. We would rather that it should go up, because it follows the driving; sometimes it goes up and sometimes down, and why it does so I do not know. You get two shafts without much difference in height, and you have one upcast and the other downcast. Sometimes you find the air going down the shaft this week or this month and up the next.

9270. Do you think that they generally attend to stopping the winzes properly so as to drive the air on?—Yes, the men soon find it out.

9271. Is it generally attended to?—The men will attend to those things themselves for their own advantage.

Capt. William Teague.

9324. (*Chairman*) What means do you adopt for supplying air when that is the case?—Either by air machines, or waterfalls, or air sollars.

9325. Have you any of them now in your mine?—Not any.

9326. You do not require it?—We do not require it.

9327. The ventilation is complete without it?—We consider it to be enough.

9328. But your only way of judging is by the candle burning?—We can easily detect it if there is poor air or damp there; the men cannot work so freely.

Mr. John Richards.

9537. (*Chairman.*) Does not the great heat in the mine cause a greater down draught, and so bring in a current of air?—No; if we want a current of air we send it down; but the air down there, the hot draught, is not so injurious as you might suppose.

Mr. Joseph Jewell.

9707–08. (*Mr. St. Aubyn.*) Speaking generally, do you consider that the mines in this part of Cornwall are ventilated as well as they can be?—I do think that they are. A great many of them are where I have been down.

(C.)—VENTILATION.

(C) *Ventilation.*

Capt. James Pope.

9843. (*Chairman.*) Are there any ends which are close and hot?—Yes, one in East Basset, the 110 fathoms, is close at this moment,

9844. Do you know the heat there?—No.

9845. How far are you driving that level off a winze?—It is about 10 fathoms off a shaft, there is not a winze yet, in about 8 fathoms more we shall begin to intersect the lode, and then we shall put a winze

9846. Having you any artificial means now for putting in air there?—The air is very good, we can accomplish the work very well.

9847. What do you mean by a close end?—The air is not quite so good, and there is not a proper ventilation: all the ventilation that we have is what comes from the engine shaft. The engine shaft is divided into two parts, so that it will give a ventilation for 20 fathoms tolerably well.

9848. Does the candle burn well?—Very well.

9849. How do you judge that the air is not quite so good there?—We generally find that by the burning of the candle.

9850. In the end where you say it is close, will a candle burn well?—Yes.

9851 (*Mr Holland.*) Than why do you call it a close end?—By the temperature, you can feel that the temperature is hotter there than in other places

9852 (*Chairman*) The candle has to be put on the side a little, I suppose?—In some places, but not there.

9853. In any other places in that mine?—No, not at present.

9854. Do you think it likely to be so when you get further from the shaft?—No, I do not see that it will; we shall have a winze to communicate.

9855. But before you communicate with the winze?—No, we can accomplish it very well.

9856 How long does the powder smoke take getting out from that end?—Perhaps about ten minutes.

9857. Not more than ten minutes?—No.

9858. (*Mr, Kendall*) When you use the words "a close end," you mean not a close end but a hot end?—Yes. The miners call it a little close

9859. (*Chairman.*) When the miners say that it is a little close, do you take any additional means for putting in air?—Not latterly.

9860. Why not?—At one time we only had one shaft, and then we were obliged to put in an air machine until we had a proper communication with another shaft.

9861. And now you think that the ventilation is very good?—Yes; it depends upon the way of the wind, sometimes it will go down one shaft, and sometimes down the other, but it goes down one and comes up the other.

9862. Have you ever observed whether it changes suddenly?—Not very suddenly.

9863 (*Mr Holland*) Does it change frequently?—Yes; when the wind gets south, the mine appears a little closer than when it is north, it is not so fresh.

9864. Do you mean that when it is warm weather the mine is closer than when it is cold weather?—Yes; we always find that in the summer season it is closer than in winter.

9865. When it is a south wind it is warmer?—When it is a south wind it is warmer than with a north wind for any length of time.

9866. (*Chairman*) You have no means of judging of the air except by the candles I suppose?—No.

Capt. Joseph Cock.

10,004. (*Chairman.*) The smkoe did not get away?—Straw causes a great deal of smoke, and there not being air to carry it away it was of course there, and we were obliged to leave the place for a certain time before it went away.

Capt. William Rutter.

10,168. (*Mr. Holland.*) Does going into the powder smoke produce any evident effect upon them?—I think that the powder smoke, with the dampness of the air, is one of the causes which bringe on premature death with them.

10,169. You think that it irritates their lungs?—Yes.

(C) Ventilation.

Charles Fox, Esq.

10,527 (*Chairman.*) It has been stated in evidence over and over and over again, that sometimes one shaft is a downcast and another is an upcast, and that that depends upon the wind. Have you ever obtained any information, or had any experiments made, in order to ascertain whether the air in a mine is not constantly travelling through the different levels, and without coming up?—No; but I have no doubt that it is often the case.

Mr. Thomas Hutchinson.

10,591. (*Chairman.*) Have you any suggestions to make by which the causes from which miners suffer by working underground might be modified?—If the climbing up the ladders could be done away with it would be very advantageous; they evidently suffer from climbing, from want of ventilation, from the powder smoke, and the dust. If the levels could be made wide, these and the ends better ventilated, and the climbing done away with, the condition of the miners would be much improved.

Mr. Thomas Gill.

11,036. (*Chairman.*) In the end that you are now driving. have you ever observed how long the powder-smoke will remain before the men can go to work?—Sometimes it might lie there for 10 or 15 minutes, sometimes three or four minutes; it depends upon the wind at the surface, and how the current of air is running through the mine; that makes a considerable difference; it is just the same as the draught of a chimney.

11,039. Is one a downcast and the other an upcast shaft?—Sometimes; it depends upon how the wind changes,

11,040 Does one shaft suddenly change from a downcast to an upcast?—Yes, very suddenly; perhaps it will change in two minutes after the wind changes, and oftentimes we are obliged to raise the shaft to draw a current when the shafts are at an equal level

11,041. By making one shaft higher above the surface than the other you would create an upcast current?—Yes, down the one that is the highest.

11,054. Then the raising of the one shaft is not a complete remedy?—But then it causes a better circulation, a great deal, of the air underground.

Capt. John Prout Daw.

11,461. (*Chairman.*) Have you any artificial means of ventilation?—No.

11,462. How do you take the air into an end when they are driving an end or sinking a winze?—It goes in naturally, our mine being well ventilated.

11,463 What sized levels do you carry?—Our levels are about eight feet high and five feet wide on an average.

11,464. How far should you consider it safe, in order to secure good air to carry a level from any winze or shaft?—I think 50 fathoms.

11,465. Without any artificial means?—Without any artificial means. That is in Tywarnhaile, although in some places you are obliged to put in timber. Timber is a thing which will eat up a great deal of air, and there you could not go so far. Where the ground is soft and you have to keep the levels abroad through timber, you cannot go as far as where you are driving a high and wide level in hard ground.

Capt. John Taylor.

11,533. (*Mr. Kendall*) The surface of your shafts are all in a hollow?—Not all of them, but they are so at Hill's part of the mine; they are low in the valley

11,534. (*Chairman.*) Out of which shaft does the smoke ultimately find its way?—You may see the smoke come out of two or three shafts, not any one in particular.

11,535. Does it always come up the same shaft or does it vary?—It varies.

11,536. According to the wind?—According to the wind; you will find a draught in the levels, sometimes it goes east and sometimes west, that is very often the case.

11,537. Does it generally change with the wind?—Yes.

(C.)—VENTILATION.

Ventila-

11,538. If it is a muggy day, without much wind, I suppose it does not go up much?—Yes, it stays longer than when there is a brisk air.

Capt. James Phillips.

11,764. (*Mr St. Aubyn.*) What is the general condition of the men in your mine with regard to their health?—Their health is very good.

11,765. How long has the mine been working?—I have been there going on 21 years.

11,766. Are there many cases of what is called miners' complaint in that mine?—No, we have not had any cases.

11,767. Is the mine well ventilated throughout?—Yes, it is very well ventilated throughout, indeed it cannot be better.

11,768. How do the men come up to the surface, by footways?—Yes, there is a very good footway for the mine.

11,769. What is the distance between the staves, 10 or 12 inches?—12 inches; some are 10, but most of them are 12.

11,770. Have you ever known an instance of miners' complaint in that mine?—No.

11,781. Is your mine more healthy than other mines in the neighbourhood?—I do not know. There are many well ventilated mines, but some little ones are very badly ventilated that I have been in inspecting sometimes. We have three shafts from the surface, and a deep adit.

Capt. Zacharias Williams.

11,807. (*Chairman.*) The principal number of your men are working in the shallower levels?—The principal part of our men are working above the 100-fathom level; there are only six men working down at the 210, so deep as that, and they are about 10 fathoms under from any communication, no more than that; they have plenty of good air.

11,829. The draught is sometimes upcast and sometimes downcast?—Yes, it changes with the wind oftentimes.

11,830. When there is no wind, and it is a very hot day above, I suppose there is not much draught either way?—Yes, there is plenty of draught then travelling from one shaft to the other.

11,831. But there is none from the surface, is there?—Yes, it must go down to come up.

Mr. William Goddan.

12,063. (*Chairman.*) Does the air go up or down that shaft?—It generally plays up the trial shaft, that shaft is about four fathoms higher than the eastern shaft. It comes down the eastern shaft, and plays in the adit level about half a mile east of the eastern shaft.

12,064. Does it change with the wind?—Yes, when the wind is north-west as well as the other way occasionally; not very often.

12,065. Then it comes down the trial shaft?—Yes.

12,066. (*Mr. Holland.*) When the wind is in any of the other quarters, does it go the other way?—Yes, always.

12,067. (*Chairman.*) When there is not much wind moving, and it is a very hot day, what happens then?—The eastern mine is ventilated. The eastern shaft, where there is the 60-fathom level, is about 293 fathoms east of the trial shaft.

12,074. (*Mr. Holland.*) Is there any perceptible draught at the 60-fathom level?—Yes; a strong draught.

12,075. Does it ever come to the bottom and go out at the top?—Yes.

12,076. At the end of the level that is driven 65 fathoms at the 80-fathom level, do you perceive any motion in the candle?—Yes, great motion; it goes towards the end.

12,077. Is the level holed through?—No, the air plays back again; it plays in towards the end. The air goes in at the bottom of the level and back on the upper part of the level.

12,078. (*Chairman.*) At what height from the ground is the candle placed where that effect is produced?—About half way down the level.

12,079. Have you ever tried where the back draught is?—No.

12,080. Is it usual at an end, at such a distance from the shaft, to have an inward draught of the kind which you have mentioned?—No, not very common.

(C.) Ventilation.

12,081. Then this is an exceptional case?—Yes, I think it is.

12,082. Can you account for it in any way?—No, not by any means.

12,083. Has the attention of the manager of the mine been drawn to it?—No.

12,084. You did not think it worth while to draw his attention to it?—No; so long as the men do not complain of the air.

Mr. James Richards, Devon Great Consols Mines.

18,807. (*Mr. Kendall.*) What is the greatest depth that you have ever driven from a winze or any air communication without the aid of a fan or jet?—We have driven something like 100 fathoms without any aid but the natural ventilation. There has been no pipe or anything.

18,808. The end has been 100 fathoms from a winze?—Yes, and the air has been perfectly good.

18,809. Had you any sollars?—Nothing at all more than the natural ventilation.

18,810. You have gone from a point where there has been a communication with the air, and you have driven 100 fathoms without any jet, or fan, or sollar, or anything?—Yes.

18,811. What height was your drift?—Seven feet.

11,812. And how wide?—Four and a half feet.

11,813. Where was it?—It was at the 60 fathoms' level, east of Thomas's shaft.

18,814. Can you at all account for that?—The ground is very good; scarcely any powder is required, and the stuff is always taken out of the drivage and put into a waggon and trammed back at once; that is done every hour.

18,815. Is it upon the course of the lode?—Yes.

18,816. The country is slate, is it not?—Yes.

18,817. Is it porous slate; is there a good deal of cleavage in it?—Not a great deal.

11,818. Are there any crevices in it?—Yes, at places.

11,819. Are those crevices connected at all with any other place where there is good air?—No, the ground is entirely new.

18,820. Is the lode rich or poor generally?—Poor.

18,821. Is there any water in the end?—Yes, but not a great quantity.

18,822. When you got to the end of the 100 fathoms, did you communicate?—We then rose something like 40 fathoms more in the same way.

18,823. As I understand you, you went in 100 fathoms?—Yes.

18,824. And at the end of the 100 fathoms you began to rise?—Yes.

18,825. And you rose 40 fathoms?—Yes.

18,826. And you holed above?—Yes.

18,827. And you used no artificial means of ventilation?—We bratticed our rise in the usual way; the two ends were always kept open.

18,828. Did the candles burn freely at that time?—Perfectly; as well as they would now in this room. We were all surprised at it.

18,829. What was the temperature when you began to drive?—I should think 45 degrees.

18,830. And by the time you got into the end at 100 fathoms it was about what?—About 60 degrees, I think, but I never tried it.

18,831. And it was 60 degrees up to the top of the rise?—Yes.

18,832. How many men had you driving?—Generally four men in the 24 hours; two pairs.

18,833. Were you afraid that more men would consume too much air?—No; but it was not necessary to push it.

18,834. The men worked 16 hours?—Yes.

18,835. Eight hours each pair?—Yes.

18,836. Should you have had any fear, if you had wanted to push it more, in working the whole 24 hours?—Not at all.

18,837. You think that there was quite air enough?—Quite; but in other places we have not been able to go 20 fathoms without artificial means.

18,838. In this mine what distance from a shaft or a winze have you ever known the air foul?—About 20

(C.)—VENTILATION.

(C.) *Ventilation.*

fathoms is the furthest point that we ever worked without a winze or rise, except at the 60 fathom level east of Thomas's engine shaft.

18,839. Have you ever found the air getting poor at the end of 20 fathoms?—Not poor, but only warm; not foul at all.

18,140. In other mines have you found the air at all foul when driving within 15 fathoms of a winze?—Yes, where a large quantity of timber has been used, and stuff allowed to accumulate.

18,841. Can you give any reason for the goodness of the air in the case which you have before mentioned, which struck you as extraordinary?—Only keeping the level clear of stuff; we always find that a benefit.

18,842. Did it turn out any ore at all?—Not a pound; we have seen a little of it, and that is all, but we have saved none.

18,843. Have you seen a man-engine?—No.

18,844. (*Mr. Davey.*) Mr. Morris said that your ore ceased to exist under the 140 fathoms?—It went down as deep as about the 140 fathom level.

18,845. What was the character of the lode when it changed?—It became more spary and with caples and a mixture of killas. In the deepest part of the mine it is precisely the same.

18,846. Was it gradual, or like a flaw?—It was almost suddenly, like a flaw.

18,847. In sinking down to the 212 fathoms did it continue pretty much of the same character all the way till you got to the bottom?—Yes, there being less mundic.

18,848. What is the change, now that you are more promising?—There is becoming more quartz, fluor spar, a good deal of mundic, and rich ore.

18,849. Some of the deeper levels on the plan have been driven, have they not?—No, they have not been down to the deeper levels until within the last three or four months.

18,850. (*Chairman.*) At which level are most men working now?—From the 40 fathoms down to the 115; there are very few men below that.

18,851. Have you a communication between all your shafts?—Every one, except the Wheal Maria shaft; we can walk three miles underneath.

Mr. Joseph Matthew.

18,868. (*Chairman.*) Is the air quite good in 150 fathoms level?—I hear of no complaint anywhere. In the 150 fathoms level we had not had very good air, and we are now putting in a machine there by which the air will be improved, but I believe that generally the mine is very well ventilated.

18,869. The machine is not in at present?—I think it is not in yet.

18,870. What distance from the shaft is the end of the level carried?—I think it may be as much as 120 or 130 fathoms, but I speak quite offhand.

18,871. What kind of machine do you propose putting in there?—I cannot tell you that.

Mr. Richard Sleman.

18,967. (*Mr. Holland.*) Is there any other peculiarity about that mine? Is it very well ventilated?—I think it is just like other mines. I think that the ventilation of the mines in this district, with very few exceptions, has been attended to, because it is the interest of the adventurers to have them well ventilated; you cannot get a man to work in a badly ventilated mine unless you pay him more.

Mr. William Gard, East Gunnislake, &c.

19,136. (*Chairman.*) How far is any level driven from any shaft or winze where the men are now working?—We are now driving for the purpose of ventilation; we are in 170 fathoms from the engine shaft.

19,137. How is ventilation provided there in the meantime?—Artificially, by pneumatic pump.

19,138. How is the pump driven?—It is worked from the main rod of the engine.

19,139. Is the ventilation produced by water?—No, it is air forced in.

19,140. Has that answered completely in the meantime?—It serves for the purpose of the number of men that we have now in the end, but we have a large quantity of ore laid open, and we have tried to take it away; we first tried artificial ventilation by driving a 46 fathom level and sinking a winze inside, and then driving a second level, hoping that we should so get a current of air, that the smoke would come away from the end and come back to the part of the mine where there is a winze up again to another level, and so away off the shaft, but it failed, inasmuch as the current was backward and not the way we wished. We have tried every way to get a current of air by doors and one thing and another but have failed, and consequently we abandoned taking away the ore until the present shaft which we are now sinking and this level are communicated.

(C.) *Ventilation.*

19,141. You did not try the application of fire?—No, it would be impossible to do so. We have about nine fathoms more to drive to reach the shaft, the shaft is not down yet, 20 fathoms sinking of the shaft will bring it down to the 36.

19,142. And in the meantime you must depend solely upon the air which is driven in?—Upon the air driven in by this machine.

19,143. How long is the smoke now getting away from where the men are working?—It goes away freely, there is very good air indeed there now.

19,144. Do the candles burn freely?—Yes.

19,145. How is the air taken in?—By 4-inch zinc pipes a part of the way, and 6-inch zinc pipes.

19,146. The machine is constantly at work, being attached to the engine?—Yes, the same power keeps the water as well as the air.

19,147. You think that that sized pipe would not admit of more men working than there are?—No, certainly not; it would be against our own interest to put on more men.

19,148. How have you ascertained that?—We ascertained it practically by the amount of work.

19,149. Have you taken any means to ascertain the number of men who can work with the power of the air machine which you now have on?—We have an end to drive, and the ore to be taken away is behind that narrow ventilation; the consequence would be that if the men behind were making a great quantity of powder smoke you never could bring your air pipe close into the end for fear of its being broken by blasting. I dare say there is quite enough for 12 or more men there.

19,176. (*Mr. Holland.*) How much air does the engine send in?—I can hardly tell; the air pump is about two feet square and six feet stroke.

19,177. How many strokes are there in a minute?—About 3½.

19,178. For how many men?—For six men.

19,179. That is about 112 feet a minute?—Yes. It is quite sufficient.

19,180. Does it pay the adventurers well to supply it?—Of course; we could not work at all without it.

19,181. Does the extra work which you get from the men pay for the engine very well?—Undoubtedly; it will at all times pay to ventilate a mine well, it does not matter to what expense you go, provided you have a paying mine. I consider that good ventilation is the best outlaid money that you can possibly have in a mine.

19,182. There is no doubt about it?—There is no doubt in the world about it. The system in all mines throughout Devonshire and Cornwall is this: you set an end, we will say, that is worth 10*l.* a fathom to drive, you give the men a price which will give them the average rate of wages of the district, our men will earn about 3*l.* 5*s.* a month, and the captain uses his judgment so that the men will get about that sum. Every mine captain will set so that the men shall get that, whether there is good air or not; if a mine is badly ventilated he finds by and by that the men instead of driving two fathoms drive one, and he still pays for that one the same price as for two.

19,183. (*Mr. Kendall.*) As you are such an advocate for ventilation, I will ask you why you drove 170 fathoms before you sunk a shaft in order to communicate and have ventilation?—Our engine shaft is upon the boundary of two sets, and before I had the management of the mine they had been working entirely westward; they had got down to about 70 fathoms, and had driven about 150 fathoms, and had driven 16, 24, 36, 49, 60, and 72 fathom levels, and it had always been a coaxing mine,—too much ore to abandon it, and not enough to pay. When I took the management we were in granite. I saw that the dip of the granite was very near the engine shaft, and I thought that by driving an exploring level into the clay slate from there I should very likely find a deposit of ore. We were just at the very junction I saw that it was very quartzose ground, and not likely to be productive, and I thought that if we could get from that into the clay slate very likely we might obtain ore. Therefore we drove an exploring level, one single level, and we very soon cut ore. As soon as we had done that we went away to a considerable distance and commenced the engine shaft for the very purpose of ventilating it, and we are sinking that shaft for the purpose of ventilation

19,184. (*Mr. Holland.*) Why did you put that engine and shaft there?—The engine shaft was for working westward; we have two shafts westward which give perfect ventilation, but when we changed the direction of the mine altogether, and began to work in unexplored ground, we drove a single level, an exploring level, and that into a rising hill; it was necessary to go off a fair distance to sink this shaft to make it pay; we are now paying 20*l.* a fathom for sinking that shaft.

19,185. (*Mr. Leveson Gower.*) Do the men complain about the ventilation?—They did when we had so many men in there.

19,186. Do you rely upon the captains for knowing when the ventilation is bad, or upon the men?—We depend upon ourselves. I go underground myself as often as I think necessary. about once a week or once a fortnight.

19,219. (*Mr. Kendall.*) As I understand, the 170 fathoms at the 36 was driven on the course of the lode?—Yes.

19,220. And then you were off the engine shaft about 60 fathoms before you found any ore?—About 60 or 70 fathoms.

19,221. How long did that ore continue?—It has continued more or less up to the present time.

19,222. What will it average per fathom?—About three tons.

19,223. What is the maximum?—Six.

19,224. When you found that there were six tons of ore did you find the air worse than when the ore was poorer?—No, I do not find any difference in working whether there is more or less ore. We never had the ore continue yielding 6 tons for any length of time. From 2½ to 4 tons would be the quantity.

19,225. How long before there is ventilation shall you go on?—We shall make a communication in November, and we shall raise no ore there until the communication is made.

19,226. For a while you have eight men working in the end?—We have twenty besides the six men in the end; we have twenty-six men in all.

19,227. How many had you driving the end?—Never more than six, two at each relief. Some have eight, but then they work six hours; that is very exceptional. We have never tried eight, but have thought of doing so

19,228. In addition to driving on this end you tried to stope?—Yes, we tried it for two months, but ceased that as we found that we could not do so.

Mr. William Hosking, West Beam Mine.

19,265. (*Chairman.*) Are any of these shafts upcast and others downcast in the draught?—Some are up and some are down. You will find the draught playing up in some of the shafts and in some down.

19,266. Are they constantly upcast, or do they change according to the weather?—They change sometimes. It depends upon the way of the wind.

19,307. (*Mr. L. Gower.*) Were they all well ventilated?—No, some were very bad indeed.

19,321. (*Mr. Kendall.*) What depth mine did you ever work in in bad air?—In Tresavean, in hot weather, where the men worked almost naked.

19,322. What depth was it?—I think I worked at the 270 fathoms.

19,323. Where the large course of ore was?—Yes, I worked there in Captain John Martin's time. It was before the man-engine was put in. I was not there when the engine was erected.

19,324. How long did it take you coming up?—I cannot say now. I forget.

19,325. Were you very much exhausted when you came up?—Yes, and very much exhausted when we came out of the levels to take the ladder.

19,326. It was so very hot?—Yes. I have seen the candles in the clay turn down double from the heat of the ground.

19,327. Did you suffer in health then?—Of course I did not have such good health as I have now.

19,328. Have you enjoyed better health as an agent than you did as a miner?—I enjoyed very good health then, but I do not know that I was quite as well as I am now. I am in fresher air now. I am always in good air, and there is not so much powder smoke.

(C) *Ventilation.*

19,353. (*Chairman.*) Then you have been in the exposed part of Devon and in the sheltered part of Devon?—Yes; the Birch Tor mine was the worst mine I ever worked in in my life.

19,354. What from?—From cold damp and poor air.

19,355. What do you call cold damp?—That is a damp arising from the rock. It settles in the level.

19,356. Can you breathe in that cold damp?—Of course

19,357. Will a light burn in that cold damp?—When it is very damp it will not

19,358. When you have been in that cold damp have you ever been down close to the rock?—Yes.

19,359. Could you breathe then?—Yes. I worked in that mine about twenty-seven years ago; it was a very rich mine when I worked there, and they had but one shaft, and in the summer time the air was very bad. I have seen the time when we could not carry in a light below the six fathoms from the surface in some parts of the season, and I being in an end I have seen my comrade in that end working, and I have gone back and have sat down, and I could see the shadow of the man but not the man, that was caused by the cold damp, and if a man put some tobacco in his pipe and took the candle to smoke, directly he took away the candle from the tobacco he could not draw any more smoke; the pipe would go out.

19,360. Is that mine at work now?—Yes. I do not wish to speak of Birch Tor mine now, for I do not know anything about it.

19,389. (*Mr. Holland.*) What do they complain of much besides that?—When men have been working in very deep mines for many years, and in very foul air, you will see them go away in consumption.

Mr. Joseph Phillip Nicholls, Frank Mills and South Exmouth.

19,449. (*Chairman.*) How far can you drive on the level away from a shaft or winze?—That would depend entirely on the nature of the lode; if the lode is small and poor we can drive to a considerable distance, and the air will continue good, but in some places where the lode is large and rich we can scarcely go any distance without conveying air by some means, either by pipes or otherwise; when the lode is small and poor, you can, comparatively speaking, go as far as you like.

19,451. In these three shafts is there one upcast, and are the others downcast?—There is one upcast and there are two downcast.

19,452. Is it always upcast?—It has been so the last two or three years, and it is also against the laws of nature, the lowest shaft is the upcast; it is a thing seldom seen

19,453. That does not shift with the weather?—It has not shifted in the last five years; just when it was first completed it shifted a few times, but it has since taken a regular draught, and continued so.

19,454. Do you adopt doors or any other means?—Yes, in some cases we adopt doors.

19,455. You take measures in order to continue the upcast?—Yes, to continue it right to the end of the mine.

19,456. What artificial means do you use when the air gets bad?—Sometimes doors and pipes, or a machine to blow air.

19,457. What sort of a machine?—A fan machine worked by hand.

19,458. Have you any water blast?—Occasionally; when there is a chance we throw a waterfall.

19,460. Is there no place at present where the air requires a fan?—The worst place that I know of is in the 60 fathom north, and that is not bad.

19,461. (*Mr. Kendall.*) How far is the 60 fathom north off last winze?—About 28 fathoms.

19,462. (*Chairman.*) Are you going to communicate with another level there?—Directly, without going any further; we are searching for the same part of the lode in the 70 fathoms, to rise and sink and form a communication. We are not in the same part of the lode, if we were we should drain the water; we only want to drain the water and put a winze through.

(C.)—VENTILATION.

(C.) *Ventilation*

19,463. In this place do the men work three corps?—They do so in some important places; we work as few by night as possible; there are none working by night in that particular place.

19,464. How long is the end free from any men?—From ten at night till six in the morning.

19,465. Do you find the air worst at night or in the morning?—It is worst at night, it freshens while the men are absent

19,566. Have you any cold damp or carbonic acid gas in that mine?—There is carbonic acid gas which comes out of the lode, but there is no cold damp.

19,492. Have you ever found that the candles would not burn there?—Yes, occasionally, and then of course the men must not stay there; they leave, if the air is even so bad that the candle will not burn; the men have no business there any longer.

19,493. Then you do put them to other work?—Yes, if it continues for any time; of course we should not keep the men idle. I have seen places where the lode has been large and rich, that you would merely strike into a cavity and you must leave directly, but in six hours there is as good air there as is here; if you let the gas escape the air will clear itself again directly, and mix with the other.

19,494. Does it extinguish the light at once in that case?—Yes, if you put it near it.

19,495. (*Mr. Kendall.*) It will not flame?—No

19,495*a*. But it puts out the light?—Yes

19,496. (*Chairman.*) Do you think that the men have ever suffered from working too long in it?—I do not know that they have. There is one class of our men that do not stand long, that is the men brought up to agricultural labour until they come perhaps to years of maturity, those men are the men who fall off quickly; but we have some men who have worked from boys who are very old; one was buried a few weeks since who worked in the mine till he was 75. There is another working on the mine, strong and healthy, 76. There is another regular miner in the neighbourhood, past 80, not working in our mine, but a regular miner.

NATHANIEL JOHN HAYDON, Esq., M.D., L.R.C.P.

19,557. (*Chairman.*) How is the mine ventilated?—I have never been below, but I produce a section of the mine. There are three shafts; the old engine shaft, a new air shaft, and the new engine shaft is now being sunk; there are numerous "winzes," and the captain and the men quite agree that the mine is well ventilated.

(*a.*)—POOR AIR.

MR. THOMAS TREVELYAN.

(C. *a*) *Poor Air.*

1305. (*Chairman.*) And, on the other hand, when the candle does not burn well does the man report it?—Yes, at once. He would say that the air was bad, and he would complain to us immediately.

1306. How would that affect the work which he had contracted to do? Should you make any allowance to him?—We are as much interested to work out the bargain as he is; we have our returns to make, and we must do it for our proprietors' sake, and for our own; we should therefore go at once, and make an improvement where it was required. We are interested just as well as the man is.

1307. Then if a man were not able to work would there be a deduction made from his allowance for the set?—It is not our policy ever to keep him at a stand still. If he could not accomplish the amount of work that he ought to accomplish if he had good air, of course he would suffer a loss, and of course he has a strong motive to report that the air is bad.

1308. Still there is also a motive for him to get through the work?—Yes; but if the air is dead against him, or he has no air, he cannot carry a light.

1309. Although the air is bad, yet as he would not be earning any thing if he were to stop work, he might persevere in working, although the air was bad?—Yes; that is the case sometimes, and perhaps he perseveres a little. We persevere sometimes, and by persevering we often do a thing, and consummate it as we would wish.

1310. But you cannot always do as you would wish?—No; and the miner understands that; and when we are doing our best, if it is impossible to do anything more, he bows to that.

1311. And then he works on to the best of his ability in the bad air?—Yes; if there was an object to be accomplished. Sometimes we want to communicate with another level, and we might be sinking and rising, and if a man thought then that he might soon accomplish perfect ventilation, he might persevere.

(C. *a.* P Air

1312. Even at the risk of injuring his health?—Yes, even at the risk of doing that; but perhaps he does not take that into consideration; that is, for a day or two.

1313. I thought you stated that it might take a month to accomplish it, and yet that a man would try to work in the bad air?—Yes; and I do not deny that they sometimes do work in air that is not good for a month or two; the air may not be good

1314. Do they ever work longer than that in the bad air?—I cannot say but what they have in some cases; in some cases they might work in that way for three months.

1315. Have they ever, within your knowledge, worked as long as six months?—They might, but I cannot tell; I cannot say that they do not sometimes, to accomplish an object. Sometimes we rise and sink, and the air might be bad; but we labour in order to perfectly ventilate the whole mine.

1316. But the men who work in bad air sacrifice their health to a certain extent, do they not?—Of course they know that the air is bad; but there may be some little additional pay that they might like to labour to accomplish, and there may be in some cases an inducement held out.

1317. They would be induced by additional pay to work in bad air?—If a man is working, and making a little sacrifice, he is worthy to be remunerated by a little extra pay.

1318. (*Mr. Kendall.*) Does it ever enter into the calculation of those who set the ground to give the men a little extra money to work in bad air, in order to save the expense of forcing in better air?—I do not think it does, not if they could put in the air.

1319. But there are some cases, as I understand you, in which you think there is very imperfect ventilation; for instance, before they can get their communication, and where they cannot have the means of forcing in the air, and in those cases the men work for some hours to the detriment of their own health?—I think that that has been so many times, even after air has been brought in artificially, but not in sufficient quantity; notwithstanding everything that has been done, the men will persevere for a month or two, and I believe the men have been rather more remunerated for that place.

MR. JAMES SECCOMBE.

1426. (*Chairman.*) Suppose the case of a new mine, where they are driving to reach a shaft?—Sometimes, in young mines, we only get one shaft to go through the lode, and I do not think that that is hardly at the same depth as if there was a second shaft down. I think that when a work becomes more extensive, and will warrant it, a second shaft should be got down for ventilation.

1427. Until that work was finished, would there be any artificial means of supplying air?—If it were very bad, we might throw it down from the surface, nd that is done pretty generally so.

1428. Have you ever seen any means resorted to for throwing down air from the surface?—At the adit level we might turn down a stream of water; and this shaft that I spoke of here that we sunk is so far without ventilation that on times we found inconvenience from the air, and I got a run of iron pipes put in nearly all the way, and just as that was done the air was considered good enough.

1429. By what means do you ascertain whether the air is good enough?—I cannot tell you; but in summer time it is affected.

1430. But how do you judge of the state of the air?—We can judge well enough only by the burning of the candle. If we get into a close place the candle does not burn so freely.

1431. Does the miner then give notice?—He says that he has a trouble to keep his candle alight; that the air is bad; and he is then perhaps removed.

1432. I suppose there are cases when you are anxious to form a connection in which the men persevere in working and in bad air?—That might happen at times, if the air was not very good, nearly upon the

(C.)—VENTILATION.

point of holing, and they would try to get through it all.

1433. Do you pay the men higher wages under those circumstances?—I do not know that we have

1434. I suppose that if the men do not complete their bargain, they must work on in bad air, or they would lose?—That I cannot tell you; not particularly; they are not bound to work if the air is bad.

1435. They would not forfeit what they had already done?—No.

1436. So that when a miner finds that he is breathing bad air he can report it to the captain, and then he would not lose?—One of the agents of the mine would go and see for himself, because if the ground had got harder since the man had taken his bargain he would be glad to get that for his excuse, and not work.

1437. If he found that he had made a bad bargain he would be apt to ascribe it to the effect of the air?—Yes.

1438. How would you test the condition of the air?—We should go and examine it for ourselves by our own candle, and see how we could breathe in it; and if the candle burnt very well, I have never known any danger occur

1439. But suppose the candle did not burn very well?—Then we should think that there was something amiss

1440. Have you any other mode of testing the state of the air?—No.

1441. Suppose that the candle burnt feebly?—Then we should say that the air was not very good

1442. Would a man, under such circumstances, be relieved from his bargain?—That would depend upon whether we thought it was sufficient to injure him or not.

1443. Do you find that by changing the position of the candle in a level, it makes a difference in the burning of the candle?—I have known instances where, just on cutting a hollow place, immediately the candle would not burn against it when it would burn anywhere else; that is perhaps for a few hours.

Mr. Richard Pascoe

1700. (*Chairman.*) Did you ever suffer in your health while mining?—Yes, I did; and it was from working in the poor air I have suffered.

1701. What was the effect produced upon you?—You feel it in your knees, and you have shortness of breath, and a pain in your head

1702. Did you get well again after you left the mine?—Yes

1703. Did you go back again to work in the mine?—Not into the poor air.

1704. How do you ascertain the presence of poor air, otherwise than by its making you feel unwell?—By the candle; and when you come into good air you feel it directly. You have a pain in your head, and pains in your legs.

1705. You do not feel it so much while you are working?—No.

1706. Do you only judge of the presence of bad air by its effect upon the candles?—Yes; at the time you are there.

1707. Were you in the habit of leaving off work when the candle began to burn dimly?—No. I have worked there many times when we could keep no light

1708. Why did you go on working under such circumstances?—Because I was anxious to get more money. It was very foolish, but when a man can get a little extra money he will work a little more

1709. Do you mean that they will work when the candles will not burn?—Yes, and if we wanted to ventilate one place to another we should just work a little more. I have run the risk of my life to work a little more to get the place well ventilated.

1710. Are the men paid for doing that?—Nothing.

1711. If you had given up the work, I suppose you would not have been paid?—Yes. We know that it must be done, and that we must go and do it, thinking that an hour or two more would not hurt us.

1712. But still you have suffered from the effects?—Yes. I did not work in it long; just for some hours, and then go off

1726. (*Mr. Kendall.*) Did you ever know a case of an agent being asked to make a small outlay of that kind, and refusing to do so?—No; but I do not know that a man would venture to ask that. I do not mean that the captain would oblige a man to go there, but the man's circumstances may be such that he does not know where else to go and get his living. (C. a.) *Poor Air*

1727. That is to say, the captain does not say, "You must go and work in that place," nor, "If you will not work in that place I will turn you off," but if a man wants employment the agent may say to him, "There is such and such a place; you may try it," and rather than not work at all the man will run the risk?—Yes.

1728. And you are of opinion that the outlay of a small sum of money would prevent that risk?—Yes, oftentimes, but sometimes it could not.

1729. Do you think it has not been done because a man has been afraid to ask an agent for fear he should be dismissed?—Yes.

1730. But you never knew an instance of a man asking an agent and the agent refusing?—No; but I do not think that a man would venture to do it.

1731. (*Mr. Fulke Egerton.*) Are the agents constantly going over the mines?—They should do so; the agent has to go into every place; wherever a man goes the agent has to go; but a few minutes will do it.

1732. (*Mr. Davey.*) Are you not aware that they pay an additional price to the workers for those ends where there is poor air?—Yes; that is because a man cannot work so much

1733. For example, if you could drive an end for 4*l.* a fathom, provided it was in good air, you would pay 6*l.* a fathom for driving it if it were in foul air?—Yes.

1734. (*Mr. Kendall.*) Do you know any instances at this moment of any men working in that way?—No, I have not been in any mine to see anything of that kind for some years. Our mine is at present well ventilated, and most mines of late have been so.

1737. Would you get many men at the present time to work in bad ends?—Yes, I think so; they would work there now rather than remain out of work.

A Miner.

1829. (*Chairman.*) For how long did you work in this bad air?—I worked perhaps six months, many others had worked previously to my coming there. I think that I took the place of a man who had been so disabled that he had to give up work, and he died in consequence.

1830. Did you know at the time when you took that work that it was likely to affect your health?—Of course I knew that the air was not sufficiently good, still being a young man I did not feel its effects directly, and of course I thought that it would not have injured me, but shortly afterwards I felt its effects.

A Miner.

1950. (*Mr. Holland.*) You say that you have worked in ends where the candle would not burn unless it was sloped?—Yes.

1951. How often has it occurred to you to be obliged to do that?—Very often

1952. How often at a time?—For twelve months at a time in many places—for many months at a time frequently.

1953. How long was it before the working in bad air began to affect your health?—Perhaps five or six months; I am not prepared to say exactly. In the first place that I speak of, it was stopped for some little time, and we worked at sinking an engine shaft, after being working there some five or six months. I am not prepared to say to a month exactly.

1954. Do you mean to say that for the whole day you had to slope the candle?—Yes, the whole eight hours.

1955. And could you work eight hours in such air continually?—Yes. When we had blasted a hole, perhaps we might go out into the fresh air there, but in many places in the old parts it would be too far down from the surface; but there we could go out from the end, because this level being taken up from the surface, we could go out and remain perhaps ten minutes or a quarter of an hour while the worst of the smoke was on, the heat would subside a little bit. In deep mines of course we had not that chance.

1956. (*Mr. Davey.*) You have been asked whether you yourself know of any place similar to the one that

(C.)—VENTILATION.

(C. a) *Poor Air.*

you have spoken of where there was such a length of level without any communication or any attempt to put in air?—I do not know any place at present.

1957. Have you ever heard of such a place before?—I cannot call to recollection such a place, but it frequently occurs in driving a level that men have to work in bad air for many months successively

1958. You do not know any place so bad as that?—No.

1959. You say that you blasted about three holes in a corps?—Yes

1960. How could you manage to do that when the air was so bad?—We were obliged to do it, we managed to do it; we had to make the best of the air.

1961. Is it not very unusual for a man to go in and bore another hole before the smoke has in some measure dispersed?—I have stated that we might perhaps stop ten minutes or a quarter of an hour between, but it is not at all unusual for men to go in after that time and work again.

1962. Do you not know that the smoke in a level of that kind will not disperse in a quarter of an hour or anything like it?—I have said that it did not disperse; we always worked in smoke.

Mr. John Sampson.

2053. (*Chairman.*) Men who have a family are often obliged to work in a bad end?—Yes, they are forced to do so, they cannot get away very well; that is the reason. They are forced to stick there because they have no chance of getting away.

2054. Do they represent to the agents or otherwise that the air is bad?—Yes, very frequently, they tell them that the air is bad.

2055. And something is done to correct it?—Sometimes there is and sometimes not

2056. Sometimes no attention is paid to them?—Yes.

2057. Is any reason given why no attention is paid to them?—They will tell you that it must be done, and that if you cannot do it some person else will. They say that it must be holed, and that if you cannot do it some person else will.

2116. (*Mr. Austin Bruce.*) What was the longest time that you ever worked together in bad air?—About three months.

2117. How did you feel at the end of that three months?—I felt as if I failed a good deal in the time, I know that I failed a good deal in the time, I felt weak and sleepy, and stupid, and almost always had a headache, a sick headache.

2118. Did you take any holyday at the end of that three months?—No.

2119. What did you do?—I still continued on at the work, because we had a better air place afterwards.

2120. Did you recover while at work?—Yes, afterwards.

2121. How long were you before you got back to your usual state of health?—I did not take any notice of that, I cannot tell, perhaps it might have been about two or three months before I got back again. Such things we do not take a great deal of notice of, generally.

2122. (*Mr. Holland.*) Was this throbbing at the head, which you have spoken of, the first symptom which you had of bad air?—Yes, a splitting headache is the first thing, and then you feel it in the limbs. As soon as you take any exertion you feel like one terribly fatigued.

2123. The knees failing under you?—Yes, everything. If you try to do anything you feel as if you were uncommonly fatigued, as if you were almost worn out with fatigue

2124. You wonder what has tired you so much?—Yes.

2126. Could you work for eight hours together in such air as that the candle went out?—No

2127. How long did you work there?—As long as we could, perhaps five or six hours.

2128. Did you work six hours together?—Yes, they generally stayed down for that time, they would come out of the bad air for a little time, and then return.

2129. How long could you work together in that very bad air?—Perhaps an hour, that would be quite enough. Then we should come up on the level, and sit down and have a little fresh air,

2130. How long was it before you returned?—Perhaps half an hour, the air would get fresh in the bottom and then we should go down again.

2131. In fact you would only work about two-thirds of your time?—Yes.

(C. a.) *Poor Air.*

2132. And then you would not work so hard?—No

2133. You would lose about half your work?—Yes.

2134. Were you not paid more per fathom for that work?—Yes.

2136. If you take your bargain in bad air, do you not make an allowance for it?—Yes, if the ground could not be driven or sunk for 5*l.* a fathom, they would give 10*l.* if it required it

Mr. Peter Clymo.

2255. (*Chairman.*) Does that draught vary according to the weather?—Yes, sometimes if you are sinking a shaft, even from the surface, in very hot weather there is no draught, and you are obliged to throw in water and lime and all sorts of things in order to break the damp. There is a sort of damp which stands, you can see it like a cloud below a certain place on looking down the shaft, and many times water or hot lime has been obliged to be thrown down in order to break it.

2319. Of course, sometimes before you can get a connexion, and where there is great difficulty in sending in air, men may have to work in bad ends; but did you ever know an instance in fair mining of man being obliged to work in bad air for as much as three months consecutively?—They are not obliged to do so

2320. But do they do so?—Yes, I have no doubt that there have been instances of it.

2321. Do you think that you have had any instance in South Caradon of men working three months in such an end?—I cannot say at all.

2322. But it is possible?—It is possible in any mine.

2370. (*Mr. A. Bruce.*) You have spoken of men having worked continuously in bad air for three months?—Yes, I have no doubt that some of them have.

2396. (*Mr. Kendall.*) With regard to the holing, if you are driving to meet a winze, and you find that you are very near, and the air becomes bad, then, as it might cause some expense to bring in air, you prefer very often to let the men work on in the bad air?—Yes, giving them an extra price for the work, for in a short time they will get ventilation.

2397. But might it not take a long time, say two or three months?—After two or three months we should put in a machine.

2401. (*Chairman.*) If that be so, why are complaints made as to the foul air? You have stated that there were men working in bad air, but if there are these machines, why are complaints made?—There are particular places we may expect in a short time to hole to a certain place where there will be a communication, and you may then have a close place for some time, perhaps for a few weeks or a month, and you would not go to a greater expense; and probably then you would give the men an extra price, and they would get on with the work as soon as possible.

Mr. W. Cock.

2558. (*Chairman.*) As a tut-man, did you ever encounter bad air?—I have in some places; I have worked in different mines.

2559. In some places have you met with poor air?—Yes, I have in some cases.

2560. How did you discover the presence of the poor air, by the burning of the candles or by your own feelings?—By the burning of the candles.

2561. Did you find that it affected your health at all?—I do not know that it ever did

2562. Did it produce any sensation while you were working?—No.

2563. You felt no effect from it whilst working?—No

2564. Was it very poor air or not?—Not very bad

2565. Was the other man who was working with you affected in any way?—Not at all.

2566. I suppose the shaft is divided?—Yes.

2567. The exhaustion of the air takes place through the ladder shaft, down which the men go, does it not?—Yes, the foul air is discharged at the surface through the pipes.

A Miner.

2625. (*Chairman.*) And in poor air?—Yes, formerly. At one time I worked in a mine under the river where the air was very light. In the granite where the air is dead there is a damp, it will act on the head first, and

(C.)—VENTILATION.

1.) Poor you get a tightness in the head, and afterwards it will cause an overflow of bile, and make you very sick.

2626. (*Mr. Fulke Egerton.*) Like a sick head-ache in fact?—Very much like a sick head-ache, and afterwards when you work in poor air again you feel it directly; it will act upon the system even for years afterwards, and in working in good air after the poor air you feel it more, if you do not take medicine; I had to take opening medicine directly on working in poor air, and it worked it off, and it relieved the system. In the damp air the candle wavers, it beats down, but in light poor air it will extinguish.

2627. (*Chairman.*) Which do you think is the worst?—The damp, what the miners call the cold damp.

2628. Is that principally in sinking the shaft?—Yes, and you sometimes get it in extending levels, and sometimes rising in the back from the long distance where there is no current of air.

2629. Would ventilation cure that?—Yes, certainly. Where there is the damp when you explode, the powder smoke will rise perhaps half up the shaft, and will not ascend to the surface; the damp will keep it down there, and many men have lost their lives in consequence, after it has exploded.

2630. Is that from the damp or from the powder?—From the damp air; powder does not affect us so much as people think, because there is charcoal in the powder.

Mr. James Nance.

2655. (*Mr. Holland.*) Have you worked in poor air?—Yes.

2656. What effect has it had upon you?—You feel very little from it when you are in it, but the sensation in coming into the fresh air is very singular; you feel a weakness for a minute or two which you did not feel before.

2657. You feel an amount of fatigue far more than proportioned to the exertion?—Yes.

2658. Do you feel a shaking of the legs and knees?—Yes, when you get into the fresh air.

2659 Do you sometimes feel frightened and nervous without any apparent cause?—No, I think not; you feel a sensation on getting into the fresh air.

2660. (*Mr. A. Bruce.*) How long does it last?—Perhaps for two or three minutes; persons who work in those close places feel chilled considerably more than persons working in good air places.

2661. Is that all you feel?—That is all I felt, because I was never so much in it as some of them.

2662 (*Mr. Holland.*) Have you ever had indigestion produced by bad air; such air as you have described?—Not that I recollect. I have felt a little indigestion latterly.

2663. (*Mr. A. Bruce.*) How long were you underground?—In my training I was underground four years, but nothing more than being trained.

2664. (*Mr. Holland.*) Did you ever work in bad air?—One month.

2665. What was the state of your health at the end as compared with its state at the beginning?—I felt languid and feeble after the end of the month, rather more than I was before.

A Miner.

2725. (*Mr. A. Bruce.*) Have you ever worked in bad air?—Yes.

2726. How long together?—I can hardly tell. I have been working underground a good while now; perhaps, two or three months together.

2727. At the end of those two or three months, would you feel worse than at the beginning of them?—No, nothing more than at any time of working. I feel head-ache.

2728. Do you sleep well and eat well?—Yes, I always do.

2729. Have you seen others suffer from it worse than you?—Yes, in time.

2730. Have you seen men obliged to give up working?—I have known men who have been obliged to give up working.

A Miner, No. 1.

2767. (*Chairman.*) Do you know any men who have been affected from working in a bad end?—Yes; I have been affected in working at Par Consols myself.

2768. What was the effect of working there?—It threw the rheumatism into my bones, and I was bad in the head. (C. a.) Poor Air.

2769. Did you get cold there?—Yes.

2770. From what?—From cold damp.

2771. What sort of thing is the cold damp?—It makes the candle burn away up; if a man is working hard and sweating, and stops a few minutes, he gets chilled very quickly if it is in a cold place.

2772. The candle rises up, does it?—Yes, the candle will run up terribly sometimes.

2773. (*Mr. Holland.*) Would your candle burn there?—Yes.

2774. (*Chairman.*) Does that damp prevent the powder smoke getting away? Were you blasting at that end?—Yes.

2775. And did the powder smoke get away quickly?—No.

2776. What did it do, did it hang?—Yes, it hung about the place.

2777. How long?—For a whole corps sometimes. I worked in one little mine, and there was plenty of circulation up in the level, but the smoke would come up six feet, and it was like a soller, it would rise no higher; we were forced to give up working there, we could not work there at all.

2778. Did the men ever fall down before it?—No.

2779. Were any means taken to remove it?—No, the place was stopped working, they rose against it.

2780. The men would not work?—No, we all of us gave up our place.

2781. How many were there of you?—Six.

2782. Did any other men take to it afterwards?—No.

2783. About how long ago is that?—About three years.

2784. What was the effect upon you of working there?—It affected me in my head.

2785. Did it produce giddiness?—Giddiness and pain and a beating in the head and heart, after six or seven fathoms I was forced to stop.

2786. How long did you continue to work in it?—Four weeks.

2787. Were all the others equally affected with yourself?—There was one not affected so much as the rest.

2809. (*Mr. A. Bruce.*) Did you know any of them?—I cannot remember any by name now, I know that several worked in one mine. You cannot go in one mine out of 20, or one out of 100 hardly, but there are some poor air places in it, hardly fit to work in.

A Miner, No. 2.

2889. (*Mr. A. Bruce.*) Have you ever been working at all in a bad close end yourself?—I have not worked in an end, but I have worked in close places, that is, in a rise in the back; the place that I am now working in, is rather a closeish place.

2890. Have you complained of the want of sufficient ventilation?—No, we have not complained; I do not know that it is of much service to complain. I do not see how they can ventilate it.

2891. Why not?—One reason is, that it would not pay. I am working now in a pitch, and the captains give us two-thirds of the pound, and it will hardly pay: 13*s.* 4*d.* out of a pound is as much as they can give, as they are allowed to give by the mining gentlemen.

2892. (*Chairman.*) Do they give that because the air is not good there?—No, it is not on that account.

2893. (*Mr. A. Bruce.*) Are you working now at that rate?—Yes.

2894. Have you been long working at that rate?—The last two or three months; it is going on for three months.

2895. How has it answered?—Not at a very great rate; perhaps we may have got 4*l.* a month. Generally speaking, when we are working in a close place, that is to say, where the air may be tolerably good but yet close, there being no thoroughfare, the agents, I consider, do not make allowance enough (and it is so considered by the men generally) in a close place; the smoke remains a long while in those places. Sufficient difference is not made between the price given for a place where there is a thoroughfare and for a place where there is none; and for the price which the agents give, we are obliged, if we have a mind to get any money to bring home to our families, to rush into the work again almost as soon as we shoot.

(C.)—VENTILATION.

(C a.) *Poor Air.*

2896. (*Chairman.*) So that in consequence of the smoke not getting away, you are obliged to go in too soon?—Yes; and powder smoke is a thing, I fancy, which chokes up the pipes as much as poor air when we are obliged to rush into it.

2897. (*Mr. A. Bruce.*) You say that men are unwilling to work in small close places?—Yes; they are unwilling to do it, but they are obliged to do so if they are minded to get a livelihood.

2898. Why are they obliged?—Because they must have that or stay unemployed, perhaps, a month or so.

2899. But there are fewer men who will go there than into better ventilated places?—Yes; none would go there if they could help it.

2900. Does not that lead to the master paying a higher rate to the men who go into ill-ventilated places than to those who go into better ventilated places?—No; they do not calculate upon getting anything more.

2901. (*Chairman.*) The agents can always get men to go into those places?—Yes, and oftentimes men are glad to go there rather than stay out of employment; but they are not remunerated better, and they can hardly get so much money there because they have not the chance; they cannot work so much, because the agents do not give a better price for a place which is not very well ventilated than they do for a place which is properly ventilated. They can always get men in our neighbourhood now. There are always men at hand willing to go anywhere and work.

A MINER, No. 5

2926. (*Chairman.*) Are there any close ends with poor air there?—No, not now; there have been in the summer time too many close ends.

2927. Have you ever felt any ill effects from close air?—I do not know that I have much.

2928. What is the difference as regards the air between summer and winter?—The air is a great deal closer in the summer time.

2929. In blasting, does the smoke get away quickly at the ends?—No, not now, it will lie there now.

2930. Is there any damp?—No, not now, at this time of the year, not in the winter part of the year.

2931. But in summer is there any?—I think there is a little in the summer time.

2932. Have you never suffered in your health?—No, I have been in the shaft over there these last 12 months; and if there is any air at all in the mine it is in the shaft generally.

2946. (*Mr. A. Bruce.*) Were you ever so tired as not to be able to sleep at night?—I have been.

2947. After what sort of work?—When the air has been close and you feel your legs aching.

3051. (*Chairman.*) How long were you working while the air was poor?—About four or five months.

3052. During that time did you suffer from it at all?—Yes.

3053. In what way?—In my stomach, and when I climbed the ladders I felt my legs trembling, just like palpitation.

MR. ANDREW KINGSTON.

3283. (*Chairman.*) Do you suppose that the air is bad there to a certain extent?—In most mines there must be ends where there is poor air, because they are driven a long way from shafts, and they have not winzes through. They get winzes through as fast as they can, I believe; but sometimes they are many weeks and sometimes months driving in poor air. Then they suffer from the effect of powder smoke and candle smoke.

3284. With regard to the poor air, what do you mean by poor air?—I mean air where there is a difficulty in a candle burning; that is the criterion here. There is, doubt, a deficiency of oxygen in it.

MR. ROBERT DUNSTAN.

3553. (*Chairman.*) If the miners are working in poor air is that taken into consideration, and is a larger allowance made to them?—You must give them more, or they could get nothing. They could not do half the work that they otherwise could do.

MR. WILLIAM WALE TAYLER.

3723. (*Chairman.*) With respect to the air, do you think that working in a bad end with poor air is a cause of the illness of the miners?—Undoubtedly, that is one cause.

3724. What effect does that produce?—It lays the foundation of disease; it affects the lungs, and no doubt produces consumption.

MR. JOHN PEARCE.

4016. (*Chairman.*) If he says that he is suffering from working in poor air, do you inquire as to the nature of that poor air?—Yes. I say to him, "How "long have you been in poor air?" He answers and says, perhaps, "We are driving in an end with the "object of getting down a rise or putting one up." I do not think, as a rule, that they do work in bad air long together. As soon as they have finished any work in this bad air they come, and they seem to have the notion that they might have such a thing as an emetic to throw off the foul air; they say, "We have been "working in bad air, and we want some medicine to "throw it off."

4025. But are there cases where, in your opinion, poor air cannot be avoided?—Yes, in cases where the men are putting up a rise to get air; I think that in those cases there may be a difficulty.

4026. You have stated that you think that a miner working in poor air for some weeks would be likely to suffer in his health?—Yes, he necessarily would suffer.

4202. (*Mr. Holland.*) Mr. Lanyon divides the cold damps under two heads; he says: "Under the first we "may place all those in which carbonic acid is found "to exist in excess, forming a variety technically "called cold damp by the miner, found generally in "shallow levels in which granite or soft killas abounds. "The effects on the system are those in a certain "degree which are well known to be occasioned by "carbonic acid; first a sensation of coldness, quickly "succeeded by a giddiness and pain of the head, sick-"ness, prostration of strength, particularly of the "knees, tremors, and a most unconquerable disposition "to sleep; to overcome which and the coldness, the "men are obliged to work most actively and perse-"veringly." In your judgment is that a fair description?—I never heard our men complain so much as that, if they did I should suppose that they had been in bad air; into an old shaft that had not been worked, they are such symptoms as they describe when they go into a place of that kind, but I never knew our men working ordinarily complain of those symptoms; a man could not work with such air, and I can understand impure air producing all those symptoms, but not where any of our men work in this district.

4203. Such symptoms are very rarely produced, they are not common?—No, certainly not.

4204. Mr. Lanyon again says: "The general character "of the compounds to be classed under the second head "differs very considerably from these. So far from "being cold, these produce a disagreeable feeling of "heat, are found in deeper situations and in harder "ground than the preceding, and owe their statistics "in great measure to the more frequent employment "of gunpowder; it is here generally that we are "nauseated by the sulphuretted hydrogen evolved by "the empyreumatic fumes already noticed, and by the "animal effluvia which must be exhaled in great "quantities from bodies undergoing the most violent "exercise in a temperature equal to that of a vapour "bath. This atmosphere is loaded also with powder "smoke, which renders it so dense as sometimes to be "absolutely irrespirable." Is that, in your opinion, a correct description of a hot end?—We have none in any mine that I have been engaged in.

MR. FRANCIS BARRATT.

4753. (*Chairman.*) Would not a tutwork man persevere in working in poor air, where he felt that his means of supporting his family depended upon his exertions?—I suppose he would.

4754. So that both the tribute man and the tutwork man may be induced to work beyond their strength, or else under unfavourable circumstances, because it is necessary to provide the means of supporting their families?—Yes, I dare say it would be so.

4762. (*Mr. Kendall.*) You have been asked about the tutwork men working in poor air to maintain their families. Would the agents allow a man to work in poor air for any length of time if they were aware of it?

(C.)—VENTILATION.

(C. a.) Poor —No, I should think not; it is not economy to let men work in poor air; the adventurers lose money by it, for the men cannot do so much work.

4763. But still there are cases, are there not, where the men do work on under such circumstances?—Yes; but that will depend upon the price.

4764. Do you think that a man would be afraid to complain of bad air for fear he might be thought to be a troublesome fellow, so that he would work on and suffer thereby?—So far as I am concerned I invite the men to do it.

4765. I have no doubt of that, but the object of this Commission is to get at the bottom of everything that takes place in mines; do you think that there are mine agents who might perhaps be rather careless upon these points?—It is possible.

4766. (*Mr. Holland.*) Do you think that that is common?—I do not know, but I should hope not; the men themselves can tell you best.

Mr. Francis Puckie.

4930. (*Chairman.*) When the fan-engine is required, does it depend upon whether the captain says it shall be put in or not?—Yes; if he thinks it is necessary to do it.

4931. I suppose you would put it in if the wind changes?—Yes; in places where we have fans working; there are occasions, for instance, we have one place in Par Consols, where, in certain winds, we cannot carry a light, and the reason of that is that the damp settles at the time the men are absent, and they are obliged to force it out again by artificial means.

4932. You force out that damp air by artificial means?—Yes.

4933. There are damp ends?—Yes, there are occasionally.

4934. How do you judge of a damp end?—If you go to a place where the damp is, the candle will go out just as soon as if you put it into a tub of water. I have seen it in our mines where they have not been more than three feet, at the back of a level, and a strong current will go through, and if you put up a candle it will go out immediately.

4935. Besides poor air, you have to contend with damp?—Yes.

4936. In that damp, have the men ever fainted and fallen down senseless within your knowledge?—Yes, I have known that.

4937. A miner can work for a time in poor air?—Yes; but in the other he could not live in it.

4938. (*Mr. A. Bruce.*) Is not that called cold damp?—Yes.

4939. (*Chairman.*) In an old mine that has been abandoned and then worked again, does this occur more frequently?—I do not know, perhaps it may. I will not say that it does.

4940. Does the damp gather at the top or at the bottom of a level?—It is generally found above, more so than below. It is possible to have it in both places.

4941. Have you heard any explanation as to what it arises from?—I do not know what it does arise from. I cannot account for it.

4942. Does it occur in Fowey Consols or in Par Consols?—I have seen it in both.

4943. At what level, or what is the lowest level at which you have known it?—We have it generally more so in the shallow levels in Par Consols than in the deeper ones; we have seen it at the 30 fathom level, and we have had it at the 80 fathom level. I have seen it in Par Consols, so that you could not carry a candle, not near the end within two feet, and that was just particularly once on coming upon a bunch of ore, and the men came up from underground one afternoon very near the ventilation, and said that the air was so bad they could not keep the candle alight. I said it was impossible, as they were so near the ventilation, and they said that they never saw such a thing in the end before. I went down the next day, and I found that the men were correct; you could stand back three feet from the end, and you could see it as well as I can see anything in this room, but you could not carry a candle not for two or three days there.

4944. The candle would go out?—Yes; after a while it subsided, it went off, and the men worked on as usual.

4945. Were any means taken to get rid of it?—No, it was not required. It went off again, and the men could work on as well as ever. The only way to account for it is by supposing compressed air to be coming out of the lode that has been made a little more porous than others, and it might come out through those pores to escape. (C. a.) Poor Air.

Charles Barham, Esq., M.D.

5277. (*Mr. Kendall.*) Taking a number of mining cases both in the hospital and in your own private practice, have you any idea of the per-centage of those who have complained to you that in their own idea their illness has arisen from working in bad ends?—A very large number of the older miners speak of poor air as being the cause of their ailments. I think they feel it themselves more distinctly; they have been perhaps working for some months in poor air, and then they feel that they have broken down; they have tested their powers to the utmost.

5278. In your conversations with them, have you been led to suppose that they have been working in many cases in very badly ventilated ends?—Certainly.

Capt. John Webb.

5355. (*Mr. Fulke Egerton.*) They are obliged to work there for the sake of getting employment?—Yes; if they put themselves out of that place, perhaps they will be out of employment, which they cannot afford to be at all times. When employment is not very plentiful they will work in these places for the sake of having work.

5357. But you consider that they suffer seriously?—Yes; all miners' lives are shortened by working in such foul air.

5358. The miners' lives, you consider, are shortened?—I have no doubt of; that has come under my observation. I have observed it very particularly. I have seen the lives and health of the tributers much better than of the tutwork men, because the tutwork men are driving on to the extreme points to a winze or shaft perhaps. Then when that is done the tributors come in and explore the ore above that level, and a current of air is kept up there, consequently the lives and health of the tributers, it has been ascertained, are much better than those of the tutwork men.

5360. How long should you say that men would go on driving in bad air to reach a winze or a shaft?—It varies very much; sometimes we have to drive 40 or 50, and I have known 60 or 70 fathoms to reach a winze or another shaft.

5361. Would it take 5 or 6 months?—Yes; it might take 12 months in some hard rock.

4362. So that men might be driving 12 months in poor air?—Yes, it is very possible, and not only possible but very frequently the case.

5363. You know that?—I know that to be the case, and every miner knows it to be the case. Sometimes levels are driven on so far that they cannot go any further, unless they have some means to drive air. Then they are obliged to put in some fan or something of the kind; but if that was only provided in the early time it would not cost more than at last, so that men have suffered a great deal, and have lost their labour through the want of such an appliance, and it sometimes has been obliged to be used afterwards.

5364. So that in those cases they are only put in because men cannot work any longer?—That is generally the case; in some cases the captains act otherwise.

Capt. Thomas Taylor.

5732. (*Mr. Austin Bruce.*) Have you ever worked in a bad end?—Yes; I have worked in close ends in three or four places. I worked in a closeish end at Tavistock, the nearest mine to Tavistock, a little further on than Crelake; it was Crowndale. The air was bad there. I suppose we were off 30 or 40 fathoms.

5733. Did you complain to the captain of being short of air?—No; it was what we termed a closeish end, but not as some people describe it to be, a very bad air end.

5734. How long did you work in it?—About four months.

5735. How were you at the end of the four months?—Just the same.

5736. Did you suffer?—No, I do not know that it had any effect upon my health.

5737. Has your health ever been bad?—No, not from working underground.

(C.)—VENTILATION.

A Miner, No. 1.

(C. a.) *Poor Air.* 5851. (*Chairman.*) Did you ever work in any poor ends?—Yes, I have worked in poor air.

5852. Did you feel it?—I felt it then for a time, but it passed away again.

5853. How did you feel it?—I felt it in my stomach and in my head.

5854. What did you do when you felt it?—I was laid up one time for about three weeks. I believe that was the longest time that ever I was laid up since I have been underground.

5855. Did you go back to the same work?—Yes; went to the same place again.

5856. Where was that?—That was at Landiscot.

5857. (*Mr. Kendall.*) Now called Fowey Console?—Yes.

5858. (*Chairman.*) Was the air the same when you went back?—No, the place was holed, ventilated.

5859. You were driving an end then?—Yes.

5860. Do you know how far that end was when you were taken ill, from the nearest winze?—We were in, I suppose, somewhere about 70 fathoms from the shaft.

5861. Between the shaft and that there were winzes, were there not?—No, there was no winze at all there.

5862. So that you drove 70 fathoms without any air but from the shaft?—Yes.

5863. Was there any cross-cut?—No.

5864. Were you driving a cross-cut?—No; we were driving upon the course of the lode.

5865. Just clearing it away for the tribute men?—Yes.

5866. About how long ago is that?—I suppose about 27 or 28 years ago; over that, it must be 30 years ago.

5867. Was anything done to give you air while you were working?—No; we holed. There was another pair that was driving from another part of the mine.

5868. But till the other pair met you you did not get air?—No.

5895. (*Mr. Kendall.*) That you must push on?—Yes; and do the best we could.

5896. You have seen a great many men; in your experience do many of those whom you have seen, in your opinion, suffer from bad air?—Yes.

A Miner, No. 2.

5938. (*Chairman.*) Have you worked in any mines where you have had bad air at all?—No; excepting Holmbush. I did not work there long. I worked in one end that was rather bad air, only about five or six months.

5939. How did you know that it was poor air there?—Because it affected my breathing.

5940. Did it affect the candles?—Yes.

5941. If the candles had burnt well, should you still have thought it poor air?—We found out by the candles that it was poor air certainly.

5942. That is the way you judge?—Yes; and we could find it to be poor air by breathing it.

5943. Do you feel any difference when it is hot air?—I never worked when the air was hot.

5944. Did you find your breathing affected before you saw the candle fail?—I do not know that I did.

5945. What was the effect upon yourself?—In climbing, when we do climb the ladders in the shaft, we feel our legs ache more than in good air.

5946. Is there any other feeling?—No other feeling more than that. I did not work in it long, only five or six months; that was at the hole at the winze that was coming down on me; this winze was coming down on me.

5947. Were there any means to throw in air to you?—Yes, as soon as this winze was holed.

5948. But not before then?—Not before.

5949. Did you complain about it?—I cannot say; it is so many years ago since I worked in poor air; it must be nearly 15 or 16 years ago.

5950. Would you work in poor air now if you knew it?—No.

5951. You would give it up?—Certainly.

5952. You think that it would injure your health?—Yes; poor air would injure anybody's health. But I do not think that it injures the health so much as is considered.

5953. What then do you consider injures the miner's health?—I am sure I cannot say what it is. (C. a.) *Poor Air.*

5954. Do the men work in poor air still?—I have no doubt that they do in many places, but not in this mine. This is a very good mine.

5955. I suppose you would always prefer going to a mine where the air was good?—Yes.

Capt. Silas James.

6040. (*Chairman.*) In those mines have you found any poor ends?—No, not particularly.

6041. But there have been some poor ends?—Certainly; there is occasionally dead air in mines, but it is always the agent's wish to try their utmost to get ventilation as quickly as possible.

6042. But delay occurs in getting ventilation?—Yes, and it will be so as long as a mine is a mine.

6043. (*Mr. Kendall.*) You hold this mine to be well ventilated?—Yes.

6044. Are the other mines as well ventilated as this?—Yes, generally.

6045. (*Chairman.*) But there are some which are not?—Yes.

6046. (*Mr. Holland.*) How do you judge that the ventilation is bad?—Because a candle will not burn.

6047. Is it not bad for you a long time before it gets bad for the candle?—No; the candle will find it out first.

6048. (*Chairman.*) In any of these mines, did you see that the candle would not burn?—I have been down in the deep levels at 177 fathoms in Holmbush; of course it is warm below, but the air is middling.

6049. How long can a man work in those levels?—For eight hours.

6050. (*Mr. Davey.*) How long is it since you inspected Holmbush?—About two years ago.

6051. (*Chairman.*) What heat was there then?—I do not know exactly. I inspected Holmbush twice.

6052. (*Mr. Davey.*) Did you find the air impure there?—No; I cannot call it impure at all.

6053. (*Chairman.*) But it was hot?—Yes.

6054. (*Mr. Davey.*) Do you not know that you may have heat, and at the same time good ventilation?—Yes; you may have a current of air passing round a good many times.

6055. (*Mr. Holland.*) You can have heat with air passing round and round?—Yes.

6056. But you do not call that good air, do you?—Yes.

6057. When the air gets hot, is it not a proof that it is the same air coming round again?—No; as it goes down into the deep mines, of course the air is warm, and as it traverses the deep mines it is warm.

6058. (*Mr. Davey.*) But the heat of the earth will not destroy much of the quality of the air?—No.

6059. (*Mr. Holland.*) When there is a flow of air through the mine, do you not find it cooler?—The greater the circulation, the cooler it is, of course.

A Miner, No. 2.

6071. (*Chairman to Miner, No. 2.*) Have you worked in poor air?—Yes, I have before now.

6107. (*Mr. Davey.*) But you preferred this for the purpose of getting a pound a month more?—Yes, sometimes.

Mr. John Borlase.

6170. (*Mr. Davey.*) What is the worst ventilated mine that you ever had?—The worst, I think, was a mine in Wendron; there was the cold damp there.

6171. What was the name of the mine?—Huel Ruby. It is a cold damp.

6172. Do you find that in the levels or in the pitches?—All through the mine.

6173. Not a continuous damp, but after, perhaps, Monday morning, or something of that kind?—It generally continues damp; perhaps it is more so on Monday morning than when the men get to their places, and in the usual way of working.

6174. Did you find any difficulty in getting the men to work there?—No, not a great deal; we only worked there for about four years.

6175. What was the cause of that mine stopping, was it from poverty?—From poverty; it was a large lode and very poor.

6176. Could you account for the damp staying there?—It was in the granite country, and the granite was in flat

) Poor

blocks, and the cold damp was always like a cloud of thick rain.

6177. Could not you dispel it by fans?—That might have been done, but it was never applied, and when you got away from the engine shaft on to the course of the lode there was naturally cold damp.

6220. (*Chairman.*) As a miner you have worked in poor air yourself?—Yes.

6221. Often?—Not a great deal.

6222. In what mines?—I do not know that I have worked in any worse than the one I spoke of just now, the Huel Ruby.

[*Note.*]

Capt. R. Dunstan.

Liskeard, 21st February 1863.

Your Lordship will please observe that there are many degrees of poor air in which the miner has to work, which is more or less injurious to his health; and although it is only in extreme cases of poor air or damp where the life of the miner is quenched out, yet I am of opinion that a man cannot work in poor air without being injured by it to a lesser or greater extent, according to the amount of labour performed, and quantity of air inhaled.

I remain,
Your Lordship's humble servant,
Robt. Dunstan.

Mr. James Richard Quick.

693. (*Mr. Davey.*) Do they not receive better wages when they work in those bad places?—I think they do.

Capt. Richard Boyns.

6807. (*Mr. Kendall.*) You stated that you have observed that there is a variation sometimes in currents, ut those variations are not very capricious, are they; they do not change every hour or two?—No; but generally these currents seem to me to be so very trifling that you can hardly detect whether the current is up or down; it is very slight so far as is detected from the surface.

6808. Can you tell from the nature of the current whether or not the foul air is (to use a mining phrase) wabbling about the different levels?—No.

6809. You think that it moves about?—Yes.

6810. It remains there, you think?—No; I think that it will pass up the mine eventually; but then it moves about through the mine before it finds its way out. It cannot get up at once, that is very clear.

6811. It takes some little while to get up?—Yes. Where there is so much good air getting into a mine, the poor air must be driven away.

Capt. Thomas Trahair.

7071 (*Chairman.*) Do you suppose that a miner would give up his work because he had to work in bad air?—I believe that some would, and that others would not.

7072. Do you not think that that would depend very much upon whether they could obtain employment elsewhere?—Perhaps so. It would depend upon what they were allowed to get in those places; where the pay is better in poor air ends, for the sake of that they will work there.

7085. Have you never heard of men being urged to drive on by an additional payment being offered to them?—Never.

7086. Do you think that the men are not tempted to do so by a higher price being paid for their work?—Yes.

Capt. Richard James.

8361. (*Chairman.*) How do you discover that an end gets close?—By the candles as soon as by anything.

8362. Do you discover it by the candles as soon as by your own feelings?—Sooner. The candle will decline before we can feel it, except we work very hard, and then we can discover it; we begin to breathe very short when working in a close place more than when working in a place where there is plenty of air.

Capt. Matthew Curnow.

8559. (*Chairman.*) What do you understand by the term "poor air"?—That is where the candle will not burn without leaning it to its side. I have worked in that many times, scores of times, for years.

8560. Did you suffer from that all?—Very little; it was cast out again; I felt a little from it once, but it passed off again.

(C. a.) *Poor Air.*

8561. Have you worked several times in places where the candle would not burn?—I have worked in as bad air as any man in the country.

8562. How did you feel under such circumstances?—I felt a shortness of breath.

8563. Did you suffer from any affection of the stomach?—No.

8564. Was your appetite impaired?—Yes; but we took a little medicine to get all right again

8565. When you were working in poor air, did you feel the effects of it afterwards in climbing the ladders?—Yes; I felt a little stupified.

8566. Was your head at all effected?—Yes; I was not lively.

8567. Did any of the other men working in the same core with you suffer from the same cause?—Yes; some of them died of it.

8568. Are there none living now who worked with you at that time?—No; not one of the pair. I am the only man that is living; but they were much older men than I was at that time; I was young, about 19 or 20.

8569. At what age did they die?—Every one of them lived, I should say, until they were between 60 and 70.

8570. Did they work underground all that time?—Some of them worked on to the last.

8571. Were they not affected by it?—Not a bit; it depends upon the constitution; some men are stronger than others.

8577. A new mine is therefore likely to be not so well ventilated as an old one?—Yes; because they have but one shaft generally; and there is one thing that there is better ventilation in the copper mines where they work shallow than what there is in the deep mines in granite, as they can sink some four fathoms for one in killas; in sinking one fathom in granite they can open four or five in the killas.

Capt. Charles Thomas.

8721. (*Chairman.*) Have you in any of these mines any end in which the air is poor?—Not now in any one of the ends in any one of the mines of which I have the management; there is not one end but where the candle will burn perpendicularly and freely.

Capt. John Daw.

9274. (*Chairman.*) What means have you of ascertaining when the air is poor?—Only by the candles; that will soon tell us.

Capt. William Teague.

9313. Is the air perfectly good at the 30 fathoms?—We find it so.

9314. How do you judge?—We judge from the clearness of the level, and the freeness with which the men can work.

9315. Do you judge at all from the burning of the candles?—Yes.

9316. How long is the powder smoke clearing away from the level?—It may be about a quarter of an hour at that distance.

9317. (*Mr. Holland.*) Never longer?—No, I should say not with us.

9318. (*Chairman.*) Is it then quite clear away?—Yes; generally speaking, a quarter of an hour clears it away at that distance.

9319. Have you ever had any close ends in your mine where the air has been poor?—Yes.

9320. How long have the men been obliged to work in that air when that has been the case?—We have set them to work an eight hours' course, but then they have not been compelled to continue the whole of that time there.

9321. They are obliged to leave before the eight hours' course out is when it is close?—Yes.

9322. How long should you think a man could work where the air is close and a candle will not burn?—We do not wish them to work at all where they cannot burn a candle.

9323. But they do work occasionally so in some mines?—We have never seen it; it has never come under my observation.

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(C.)—VENTILATION.

a.) *Poor* r.

9335. (*Chairman.*) The cold damp is different from what you call poor air, is it not?—Very different.

9336. How can you discover the difference between the cold damp and poor air?—Where there is poor air the candle will not burn at all, unless it is put in a different position. But we detect cold damp from the feelings; there is a curious feeling which comes over us, and we can almost see it above the level.

9337. You see a vapour?—Yes, a sort of a mist

9338 Does the cold damp affect the wood in the mine; is there any white appearance?—I think not.

9339–40. Does the cold damp appear to be at the lower part of the level, or does it fill the whole of the level?—Generally speaking we find that it is at the lower part of the level, unless there is a stream of water; water may have a tendency to break it a little, if there is a stream of water flowing through the bottom of the level

9341. And that would make it ascend?—Yes, a little, I think.

9342. Do you find this cold damp when the men have not been working or while they are working?—We can detect it more after they have ceased working and when you go into the place again, but we find that the men feel very much from cold damp even at the time when they are working

9343. How does it affect them?—It affects their breath; they cannot work freely.

9344 Does it affect their stomach?—I think that it has a tendency to affect them in the stomach.

9345. Do they use any remedy when so affected after working in the cold damp?—I do not know that we have ever had any cases, if a man is ill he goes for the doctor.

9346. Do you use any remedy to get rid of the damp?—We use the same means to get rid of the damp as we should to get rid of the poor air

9347. (*Mr. Holland.*) Is the damp most usual in dry or in wet mines?—In my experience it never occurs but in the granite mines; the granite has a tendency to create a damp.

Mr. John Cady and Capt. Pascoe.

9793 (*Chairman.*) You have inspected several mines and you are well acquainted with them?—Yes; I have inspected a great many.

9794 It has been stated in evidence before the Commissioners that in some cases cold damp is found, have you ever seen that in a mine?—Yes, in granite mines.

9795. I believe that is different from what is called poor air?—Yes

9796. Can you describe what it is?—I suppose it must be occasioned by a dense sort of foulness in the air, and granite mines are more subject to it than in the slate.

9797 Is yours a granite mine?—Yes.

9798 Is there cold damp in your mine occasionally?—Yes; in some places occasionally.

9799. Does the cold damp arise from the rock?—Yes; I should think so. We have it more especially in granite than in the killas. It accumulates in the mines where they have not been worked for a long time.

9800 Did you not find something of the sort lately?—I never found anything myself nor have I heard any complaint.

9801 What means do you take to prevent it?—We have generally, at every 15 or 20 fathoms, air winzes from level to level, and in some places we have been compelled to force in air by machines, and we have forced it in by a jet of water. We have tried different means, and I think that a jet of water is a very good thing in many places, especially in rises.

9807. How do you judge whether it is cold damp or poor air?—You will find that the candle will burn very well.

9817. (*Mr. Holland.*) Do you think it affects the health of the miners?—Yes: if they continued in it long, I should think it would.

9818. I think you say that it only arises when men have ceased to work for some time?—No; sometimes it is when the men are employed daily in it; but in the levels we try to do all we can; sometimes there is a current of air through a level; but it does not ascend or descend, and sometimes we try to use means to get it up.

9819. Are these cold damps of frequent occurrence?—No.

9820. Are they of rare occurrence?—Yes, they are.

9821. Poor air is never found except in mines which have been worked?—Yes.

(C. a.) *Poor Air.*

9822 Is it not exclusively found in mines which are worked?—No.

9823 Do you think it ever occurs in mines which have not been worked for some time?—I think so, in many mines which have not been worked it is very dangerous to go into them at all

9824 (*Chairman.*) Can you point out the difference between cold damp and poor air?—In poor air a candle will scarcely burn; but in cold damp it burns very well

9825. (*Mr. St. Aubyn.*) Cold damp has no effect upon the candle?—A very little indeed, you would think you had capital air by looking at the candle; it does not even waver sometimes.

9826. (*Mr. Holland.*) Does cold damp ever produce a feeling of faintness?—Not that I am aware of.

9287. (*Chairman.*) Do you think you could procure a bottle full of this cold damp?—I do not know whether we could now; but a bottle might be put down.

9828. I suppose it is not very commonly met with?—No; our men are now tolerably healthy.

Capt. Joseph Cock.

9986. (*Chairman.*) Have you ever worked in foul air yourself?—Yes.

9987. What was the effect?—I never felt any bad effect.

9988. Have you ever heard of men being affected by it?—Yes

9989. How does it affect them?—In different ways. Sometimes they feel weakness in their limbs They sometimes complain of weakness in their knees, and sometimes complain of their stomach. They have no appetite for meat and such like, and then they gradually decline away. A shortness of breath comes on, there appears to be a contraction of the lungs; and they are unfitted for labour and for working.

9990. Has it come on suddenly with any man that you know?—Gradually.

9999. What is the difference between cold damp and poor air?—With cold damp a candle will burn bright, but if you stop after perspiring you will feel a chill go through your body. In foul air a candle will not burn, it will go entirely out.

Capt. John Michell.

10,067. (*Chairman.*) Before you put in the pipes, how did you judge that the air was not good?—Of course experience tells us when we get into any poor air, because we can tell by the smell, and also by the smoke lying after they have shot the holes.

10 069 Have you anything like cold damp?—All granite mines are a little subject to cold damps.

10 071. It decays?—Yes, it is owing to the decomposed granite chiefly that the cold damp is caused, and it will decay timber twice as fast as otherwise

10,073. When you have perceived this cold damp, has it been when you have been sinking a winze or putting in a rise or a level?—Sometimes in sinking a winze or a rise we see a little of it

10,074 Does it appear in the shape of a vapour?—A small vapour. We see it just about a foot, or a foot and a half from the bottom of the level.

10,075 (*Mr. Holland.*) Do you never see it at the top?—No, we find it at the bottom of the level, and if you put a candle at the bottom of the level it will waver just the same as a current of air, while at the back it will burn quite clear.

10,076. If it is always at the bottom of a level and not at the top, how does it get into a rise?—There is more of foul or poor air in the workings above the back of the level The cold damp is in the lower part of the level, the fresh or good air is in the upper part When I was a boy I held a candle at the bottom on purpose, and I saw it waver very much, and I used to fancy that it was then good air, but the men told me that that was nothing but cold damp, and that is all in the bottom of the level In the back of the level it is good air, and the candle will burn quite clearly. The good air has an action to keep the damp out.

10,077 (*Mr. Davey*) Supposing you are sinking a winze, and you come up on the Saturday and go down again on the Monday morning, will you find any accumulation of damp there?—Yes, we find more in the winze than anywhere.

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Capt. William Rutter.

10,185. (*Mr. Holland.*) What is your explanation of the granite mines being more unhealthy than the killas mines?—Because there is more cold damp in granite. I have men now who come over the hill and say, Can you give us a job; they say they have been working in the granite, but they do not like to be down there so well.

10,186. How does the cold damp affect them?—The granite in some way produces a colder, sleepier damp than the clay slate does.

18,187. What effect does that produce upon the miners?—It debilitates them.

10,188 Does it make them more liable to lung disease?—I am sure it does.

10,189. Is that a prevalent opinion among miners?—I think so; it is my opinion, at all events; miners say so.

10,190. And in your opinion that is in consequence of the greater amount of cold damp in a granite mine?—Yes.

10,191. And not the greater prevalence of dust?—No.

10,192. Is there more blasting in granite mines than in killas mines?—Yes, because you work more; you work with a pick in killas mines, and blast less.

10,193 May not the effect be partly owing to the less prevalence of powder smoke in killas mines?—That may be a cause, but if you go into a deep granite mine you will find a sleepy coldness. I have proved that to be the case, and I have heard hundreds say so as well.

10,194. After there has been a blast of powder a great deal of that gas is produced which when cold becomes cold damp. Does that explain it partly?—That is one reason, I should say, but I do not think that that is all the reason.

Mr. Thomas Gill.

10,994. (*Chairman.*) Where this work is going on that you have just alluded to is at the 152 fathom level?—Yes.

10,995. How is the air at the 152 fathom level?—The air is not bad there.

10,996. Have you tried it at all?—No, we have put in a machine because the air was a little close.

10,997. How did you judge whether the air was close or not?—By the burning of the candle.

10,998. Did not the candle burn well?—No; and the end being very wet we have a great deal more trouble where the air is a little weak in the wet ends than in the dry ones, in keeping the flame of the candle upright.

10,999. Is there a machine at work there now?—Yes.

11,000 What kind of machine is it?—A fan machine.

11,001. Is it worked by a boy?—Yes.

11,002. Where is it placed?—It is placed back within 3 or 4 fathoms of the shaft.

11,103. How near are the pipes taken to the end of the level?—To within 14 or 15 feet

11,004. Do you mean from the bottom of the rise?—No, it is in close to the end at which they are driving west

11,005. You are driving a rise?—Yes, they are rising at the back of the same level

11,006. How far is the rise from the end of the level?—I should suppose about 14 fathoms.

11 007. Is the air in the rise close?—No, we have a branch of the pipes going up into the rise.

11,008 And going to within 14 or 15 feet of the end of the level?—Yes.

11.009 Where is the fan placed, is it near a winze or a shaft?—It is near a shaft.

11,010. How far has the air to be driven?—To about 20 fathoms, that is the greatest distance; it is a very short distance for a fan machine; for our air is not very bad; not where we placed the machine to force the air at first

11,014. In what kind of strata is bad air more likely to be produced?—I think in granite principally; I think that the foul air in granite does injure the miners more than in any other kind of strata that I have seen.

11,015. Another term has been used for the cold air that is found in granite, namely, cold damp. Is that what you would understand by cold air?—Yes.

11,016. Is that in your opinion different from poor air?—No; oftentimes the air does cause this cold damp in the levels.

(C. *a.*) *Poor Air.*

11,017. In a level where there was cold damp, if there were many men working in it the evil would be aggravated?—No.

11,018 On a Monday morning, when the men return to their labour, is it found that the cold damp is worse?—Not in the ordinary way of working, I think, because in going down to an old mine, we oftentimes find a greater chill in an old mine that has been left idle for some time than what we do in going down a mine of some magnitude that has been in course of working a few days before; there is a great difference; you find a chill and a cold dampness in an old mine more so than in a mine that is in the regular course of working.

11,019. Do you think that that cold dampness is more injurious than what is termed poor air in close ends?—We miners generally consider it so.

11,020. What effect has the cold dampness upon the candles?—It does not take much effect; it is only just upon the system

11,021. You cannot judge of it by the candles?—No.

11 022. Have you ever observed in sinking a winze in any mine the cold dampness of the air so bad that the men could not work in it?—Yes, I have seen cold damp many times so that we have been obliged to throw down furs to try to break it, and have many times thrown down powder and set fire to the powder before we got it away, and burnt hot lime; I have seen places before now where a candle has been just cooled out four or five feet above the back of a level; there has been a current of air at one place, and you could pass along very well, and damp has formed there, and I have put a candle to it, and it has quenched it just the same as if it had been dipped in water; the damp would form just in the back of the level above us. That was near Devonport, and that was the only mine in which I ever saw it.

11,023. Could you detect the cold damp by the eye?—Yes, we could when we came to examine it afterwards

11,024. What appearance had it?—It had a lightish colour, more so than the air in the level, because it is generally a smoke or a steam that is passing through the levels.

11,025. Do you think that the cold damp is generally a steam or a smoke that is passing through the levels?—No, I say that it generally looks whiter.

11,026. What effect was produced by throwing powder down upon it and igniting it?—It did not take any effect upon it, not the least; I have seen the damp form in a winze in a bottom level just the same as you would see a fog at a certain distance.

11,027. Did you expel it by the expedient you resorted to?—No.

11,028. Could a miner have gone down to work in the place at the time?—No.

11,029. Would the fan-machine drive it out?—Yes, very soon.

Capt. John Hancock and Mr. Michael Morcom

11,218 (*Chairman.*) Have you ever worked in a close end?—I have never worked in a close granite end, but I have had to do with it a good deal.

11,219 What is the effect upon the candles in a close end?—Of course you require to touch a candle up pretty often, and to put it on a certain angle, and to snuff it often.

11 220 But that is not the case in cold damp?—No, I have never seen any cold damp which would have that effect

11,221. Have you ever seen when the men have not been working in any winze, or at any end, that the candle would go out?—Yes, many times; and I have kept the candle before me, and I have gone so far as that the candle has died out, and then I have kept back. When we find it like that we of course use means to put air in before the men go in

11,22 2 Might not this have been equally the case if the men had been working there?—No

11,223. If the men had not been working there how would you manage?—If you carry a good strong breeze of wind through pipes, or some other means, you get rid of it. I have known places which have been communicated, say, for instance, an end, when we could not get into that end, and after communicating a winze with that end we could see the damp, it would affect the

(C. a.) *Poor Air.* light in the winze as it was escaping through the place which was communicated.

11,224. When you have connected a winze with a level where this bad air has been, have you seen the effect of it?—Yes, upon the candle.

11,225. But have you been able to see anything in the shape of vapour?—No; I do not know that I ever discovered anything of that sort. I have seen it upon the bottom of a winze or close in an end, and we have seen it form like a mist, that we have seen repeatedly; and sometimes in dropping a candle down in a winze we have seen it like a smoke, and the fire is out of the candle in an instant.

Capt. William Higgins.

11,403. (*Chairman.*) Have you ever worked yourself in a close end?—Yes.

11,404. In what mine?—In Huel Coates, and in Wood mine.

11,405. What is the closest end which you have ever worked in?—It was in Wood mine.

11,406. What was the effect which you felt there from working in close air?—It left an effect upon the chest and lungs; for four months after I gave up there I was not able to work.

11,407. What level was that?—20 fathoms under the adit.

11,408. How far from any winze were you working?—132 fathoms, I think.

11,409. Were you driving at that distance?—Yes.

11,410. Had you any means of ventilation?—Air sollars.

11,411. Do you think that that was sufficient ventilation?—No.

11,416. Did you ever work where you had to throw in lime before you went into work?—No.

11,417. You have heard of that being done?—Yes, many times.

11,418. How long were you working in the close end which you have just mentioned before you were obliged to give up?—I worked in that place seven months.

11,419. How many others were working there?—There were only two of us.

11,420. Did the other man suffer also?—Yes, he only lived two years afterwards; he was laid up at once.

11,431. (*Mr. Kendall.*) You say that when you were working in this end, 132 fathoms from my shaft, you felt poorly at the end of two months?—Yes.

11,432. And you knew that the air was doing you harm?—Yes.

11,433. But still, as you were encouraged by this high pay you went on?—Yes.

Capt. John Prout Daw.

11,456. (*Chairman.*) Have you ever yourself worked in a level where a candle would not burn?—No; although I have worked where it was poor air.

11,457. How do you know that it is poor air if the candle burns?—We are obliged to turn it on one side. It will not burn upright.

11,458. That you call poor air?—Yes.

11,459. If the candle went out what should you call it?—We should call it very bad; we should not like to stay there.

11,460. But there is no place in your mine where the candle has to be put on one side in working?—No.

Mr. John Bryant Wilkin.

11,613. (*Chairman.*) Have you ever seen men working in what is called poor air?—Yes, I have myself worked in it; and I have seen men working in it of course many times.

11,614. By what other means than that of the candle not burning well, can you ascertain whether the air is poor?—We feel it in the chest—a want of something—a faintness; we cannot work, and cannot make that effort that we could in good air, a person finds out that there is not anything to breathe.

11,615. Do the miners recover immediately on going into the fresh air?—I think not; not immediately, but of course if they got into better air, and exerted themselves, they would find that they had something to work upon.

11,616. Have you known men who have been working in poor air go to another level, and there work without feeling any effects from having worked in poor air before?—In a mine where I had the management, and where there was the worst air, the men, before going into good air, required medical treatment in order to prepare them; they were not fit to work in good air for a week or two; they were worse when they went to work in good air than while they continued in the bad air. For the first week or two, after going into the good air to work, they felt such a change that they required to have an emetic, and some other treatment. (C. a.) *Poor Air.*

11,617. Was it owing to any difference in the temperature?—It was not the temperature, it was the want of the air that they had been employed in, and then getting into good air to work, it had an effect upon their system, so that they did not feel well, and they were sickly about it.

11,618. But after working for a certain time in the good air, and being under medical treatment, they recovered themselves?—Yes.

11,619. Have you ever known any miners who suffered permanently from the effects of the bad air?—Yes, I have seen many laid aside by the bad air.

11,620. In what mines especially had those men worked?—There was one of those men that I speak of from Trumpet Consols.

11,621. Was he not able to work in the mine?—He wore out soon, and he is dead. The miners droop away when they get worn out, and catch cold, and die.

11,622. If a man was to leave off working underground and was to come to work at grass, do you think he would then recover?—He would last many years longer.

11,623. If he were to go back to work in the mine after he had been affected in the way you have described, what would be the result?—If he kept at it until he was done up he would very soon succumb to it, but by giving in and going to some other employment he would save himself; if he were to drive a donkey cart and carry coals about. I saw one just now who had been an old miner, and I have known him for many years.

11,624. Did you ever suffer permanently from any ailment?—Not myself.

11,625. In the mine with which you are connected, are there any ends where the air is close?—Not that are really bad; they are close, as will naturally be the case.

11,626. How far is it safe to drive from any shaft or winze to put in a rise?—If a level is driven say 7 or 7½ feet high and 4 feet wide, we can get in 30 or 40 fathoms; more than that would be very close.

11,627. If you are following a lode, would it make any difference whether you had to sink downwards or incline upwards?—If we are following the lode, we can continue to a long distance sometimes, but, unless there is additional height, it would not be safe to go any further. I think that a great deal depends upon the size of the passage.

Capt. James Phillips.

11,707. (*Chairman.*) Was it cold damp or poor air that was found there?—Cold damp; the candle would burn, but it was cold damp; but there is not so much working there. I did not know that for some time, but we found that the men complained a little bit of it, and we had it ventilated directly.

11,708. What did the men complain of, what was their sensation?—They complained of weakness and so on in their limbs, and they did not know what was the matter; then I considered that there was cold damp there, and from that time we ventilated the place, and it has been all right since.

11,709. Was this in the back or in the winze?—They were driving an end and a little working in the back; it did not continue for more than a month.

11,710. How long do you suppose the men had worked in that place before they complained?—Not for more than a month.

11,711. Were any of them thrown out of work in consequence of it?—No.

11,712. Can you describe the difference between cold damp and poor air?—I can hardly explain it; I suppose that there is not sufficient air to bring out the cold air that has been there for some time, but I can hardly explain it; we do not take so much notice of these things when the candle burns all right.

11,713. When the candles burn all right then you think there is nothing to be afraid of in the air?—Yes.

11,714. Have you any means of ascertaining whether

(C.)—VENTILATION.

there is cold damp in a mine except by your sensations?—No, I do not know that we have had any such thing in our mine more than in this one place for a month.

11,715. In that cold damp the candles burned well?—Yes.

11,716. In poor air they would not burn well?—No, not in very poor air.

11,780. (*Mr. Holland*,) Have you ever worked in poor air?—Yes, when I was young, a little; but I used to get out of it as well as I could. I did not like it very well.

Capt. ZACHARIAS WILLIAMS.

11,835. (*Chairman.*) In the course of your experience have you ever found poor air or cold damp in your mine?—Yes, we have had poor air, and we have had what we call cold damp for a certain time, where we have had reason to have a long distance, sometimes driving for a communication, and sometimes we are driving cross-cuts to make a trial, and it is not possible to get a communication unless you meet with something occasioned by sinking the shaft.

11,842. How do you tell when an end is close?—It will tell for itself; there is a heaviness or a deadness to what there is where the air is lively and active.

11,843. Have you any means of ascertaining whether the air is close, except by the men complaining that they feel it, and are affected by it?—Yes, in a very close place a candle would not burn so freely.

11,844. When you find that you are obliged to incline the candle, do you immediately resort to some means of forcing in air?—We do it before; we do not allow it to come to that. We always keep in the mine conveniences for throwing air in before there is anything to complain of.

12,485. Have you ever known the men suffer from working in poor air?—I have heard of many; not in this mine.

11,486. Have any of the men under your charge suffered from it?—No; we have never had any occasion to see anything of the kind; we always make preparation as I tell you.

11,847. Have you ever seen men suffering from the consequences of working in bad air?—Yes, I have in Cornwall.

11,848. But not in Devonshire?—Never one in Devonshire.

11,849. (*Mr. Kendall.*) In what part of Cornwall have you seen men suffering from working in poor air?—About Gwenap, say 30 years ago.

11,850. (*Chairman.*) Have you worked as a miner in Cornwall?—Yes.

11,851. Have you ever worked in poor air?—I have worked in close places, but I never felt anything—never anything to feel any effects from it, but I have seen afterwards who have been working in it.

Mr. WILLIAM SKEWIS.

11,970. (*Chairman.*) How do you know when it is necessary to apply the machine?—We can tell that by the draught and the smell; the air is not so good.

11,971. Do you judge of that or do the men judge of it?—We can always detect that without the men saying anything; of course the men will make mention of it if they find that the air is not satisfactory to them, and we then apply the air machine.

11 972. You can judge of that by your own inspection?—Yes.

Mr. JOSEPH PHILLIPS NICHOLLS, Frank Mills and South Exmouth Mines.

19,535. (*Mr. Kendall.*) Have you experienced the effects both of carbonic acid gas and of cold damp?—I have.

19,536. What is the difference between the two in the feeling?—In cold damp you would begin to get sleepy directly, and feel your legs to tremble, but the carbonic acid will put out your candle; the cold damp would have an effect upon you as quickly as it would put out the candle, or rather sooner; but in the other, before you feel the effects of it your light is gone, and hence you retire.

19,537. (*Mr. Holland.*) Does the light go out at the bottom of the level?—The air is very good there.

(C. *a.*) *Poor Air.*

19,538. (*Mr. Kendall.*) Can you see cold damp?—You would see it as a mist before your eyes and your candle would be blue.

19,539. (*Mr. Holland.*) Is it a peculiar looking mist?—Yes, and you feel a curious sensation too as soon as you get into cold damp.

(*b.*)—TEMPERATURE.

(C. *b.*) *Temperature.*

Mr. F. PUCKIE.

4895. (*Chairman.*) Nor in Par Consols?—No; that is not so high as Fowey Consols; in some places they are very warm, perhaps some may be between 70° and 80° in Fowey Consols.

4896. Do you know how long the men can work in that hot level in Fowey Consols?—No; they calculate that they work there eight hours; but in those hot places they do not work, perhaps, more than about six.

Mr. ALFRED CHENHALLS.

7152. (*Mr. St. Aubyn.*) You stated just now that the copper mines were considered less healthy than the tin mines, what in your opinion is the ground for that assertion?—I cannot give you a reason why it should be so, but general experience, I think, will show that that is the case. In the Botallack and the Levant mines, which were the richest and full of copper, it was found that they were the hottest for working in, and some of our miners say that they know almost from the rise of the temperature that copper is near.

Mr. JOHN NANKERVIS.

7210. (*Chairman.*) Do you consider that the copper has anything to do with the increase of heat there?—We think so.

7211. Has any experiment ever been tried in order to ascertain that fact?—There was some years since, but there has not been of late.

7212. What plan was adopted in order to test whether the temperature was higher where the copper was than where the tin was?—We considered the copper ore to produce the heat more than the tin

7213. Was that in granite or in killas?—Killas; but we had it in granite too in parts of it, but principally killas.

7214. Is there any difference in the heat between the parts of the mine that are in granite and the parts that are in killas?—Yes, we generally find it most warm in the killas.

Mr. JOHN NANCARROW.

8482. (*Chairman.*) Is the air not quite so good in that level?—It is warm.

8483. Which level is that?—The 170.

8484. Do you know at all what the heat is in that level?—No, we never tested it.

Capt. THOMAS RICHARDS.

8899. (*Mr. Holland.*) Are there any hot or close ends in the mines of which you have charge?—They stand at about 78° or 79°, that is about the hottest.

8900. Is there any difference in the length of time that a man can work in an end according to the heat of it?—As regards a man being able to work in an end, that depends upon what sort of condition he is in, and how he lives. If a man is in good condition, by practice he would be able to work longer in those hot ends than other men could.

8980. The Commissioners have been informed that the miners work in 78°. Do you think that that is excessive?—I think it is when you get above 78° or 80°. It is not from that downwards so much, but it is above 78° or 80°; then there is a great loss of effective labour. It is unnatural for a man to work in an oven; it is too hot for a man to work in 80° for a great length of time.

Capt. JOSEPH VIVIAN, North Roskear.

9122. (*Mr. St. Aubyn.*) Do you observe any change of temperature in the ends when they come to the tin?—No, I think not, visibly. In the eastern part of our mine we have a place or two remarkably hot, and what the reason of that is I do not know; there is neither copper nor tin in the ends at present, but the water is hot and the air is hot.

9123. We have had evidence at St. Just that the copper was a great deal hotter than the tin, and that

(C. b.) *Temperature.*

the men where they were working always knew when they were approaching copper by the increasing heat in the ends; have you observed anything of that kind in North Roskear?—No, never.

9124. What level is it where you find it so hot now?—At 140 fathoms below the adit, that is to say, 160 fathoms from the surface; we are 270 fathoms from the surface in the deepest part of the mine.

9127. (*Mr. Holland.*) Is there much water?—Yes. We always find the air and the water of the same temperature.

Mr. John Richards.

9443. (*Chairman.*) Could you work the mine without the man-engine?—Not at the bottom; the heat is so much, we could not work at the bottom without the man-engine or a skip; we must have one or the other.

9444. Because the heat is so great?—Yes; and that does weaken the miners; they cannot work a core as they could, or climb up; they would have the hardest work to go through at the latter part of the time.

9445. You mean that they would become so exhausted by the heat that they could not climb up the ladders?—I think they could not, they would not be able to do it.

9448. What is the heat at Wheal Clifford?—The heat is 102° at eight fathoms and a half under the 200.

9449. What is it at the 220?—About the same; it may be 2° more perhaps.

9450. What is it at the 230?—Hotter, a pretty deal. I should think that you might call the heat there 120°.

9455. Does the heat vary when the men are working?—Perhaps the heat is a little more; a very trifle; not much.

9463. Are they at work?—Yes; I should think that there are working in the back of the 220 fathom and at the back of the 208 fathom levels as many as 60 men in different pairs.

9464. Is the heat experienced by each pair in that level the same?—Yes; in this level the heat is not so much.

9465. Is the heat the same throughout?—Yes, it is exactly the same there.

9466. What is the heat at that place?—The heat there is about 96°.

9467. Are the men who are driving the 220 fathom level exposed to the same heat?—Yes, it is about 102° there.

9468. How long do the men work in a place where the heat is 95° without going back to obtain fresh air?—They work for four hours out of six, or five hours out of six, and they can stand it pretty well; they have been brought up from boys to it.

9469. How long can they work where the heat is 102°?—They cannot stay there, I should think, without going back an hour.

9470. Do the miners work where the heat is 95° for four hours consecutively?—Yes, very regularly.

9471. Where the heat is 102° you say they can only work for one hour?—Yes, they can only work for one hour before they go back.

9472. How long do they stop where they go?—They stop an hour, I should think, and I suppose that we can get about half the work out of a six hour core—three hours work.

9473. At the 220 fathom level, how long do they continue at work?—Perhaps in the 220 fathom level we can get just the same as in the stopes, they stay in perhaps an hour and a half, then they go back for half an hour, and then they go in again, and so on; but they are obliged sometimes after the explosion of the powder, and until the smoke is cleared away, to come back.

9474. Suppose they were driving a cross-cut at the 230 fathom level, would there be any difference whether they were driving a cross-cut, or driving towards the lode?—Yes, I should think they could stay longer in the cross-cut than in the lode.

9475. For what reason?—Because of the fumes of the lode. There is more sulphur in the lode than in the country, the country here is all clean in the branches, the lode is hollow.

9476. When you cut a load do you find more heat there than in the country itself?—Yes.

9477. And the lode gives out that heat?—Yes, the lode gives out heat more than in the cross-cut.

9478. Can the miners work continuously for one hour in the 230 fathom level?—Yes, I think they can if they are used to do it.

(C. b.) *Temperature.*

9483. (*Mr. Kendall.*) They cannot bear the change from 70° to 90°, nor from 60° to 70°?—No, not for a month, they will take cold and get ill.

9484. How are they affected when they become ill?—They are affected in the chest; in the pipes.

9485. They are so affected if they have been working in a hot level and change to a cold one?—Yes, they will get affected in the chest.

9488. (*Mr. Holland.*) What effect does the increased heat produce upon them?—They get languid and faint.

9489. And not affected in the lungs?—Yes, they are.

9490. (*Chairman.*) If the miners shift from 70° to 95° they feel faint?—Yes, and languid.

9491. Are they not able to continue at their work?—No, perhaps they may work there for a day or two, and than they will want relief after a while; if they can stand it a month they will be able to get on.

9492. Do the young miners suffer so much as to be obliged to leave off work altogether during the time of their training?—No, it just depends upon a man's constitution. Some will stay there and not be affected at all. I know many of them who are there that have been there for twenty years and are not affected to appearance by it, but by and by if they are taken ill they are gone very soon.

9493. (*Mr. Kendall.*) You say that you have known men who have been able to bear this excessive heat for twenty years, but when they are attacked with illness they are carried off very rapidly?—Yes.

9494. Do you recollect the state of the mine before you holed at Wheal Clifford at the 208 fathom level, when was the hottest time?—About ten years since, before we holed at Wheal Clifford at the 200 fathom level.

9495. Do you recollect what was the greatest degree of heat at that time?—I suppose it was 128°.

9500. What was the mode of working that you pursued?—They would work in this way the men would go in till they got tired.

9501. How long could they stand it at that time?—An hour perhaps was a long time, say half an hour.

9502. Had they plenty of water there to drink?—They always had plenty of water to drink; they had a long way to go back.

9503. Did those men fail much?—I do not think they did.

9504. Do you know anything about their appetites, did they eat well?—Yes, pretty well. The men stood the work like that pretty well; they were not working more than half the time; they were an hour down, or hardly that.

9511. Is it not worth your while to try to reduce the temperature there?—I do not know how to do it.

9515. How much do you think you could reduce the heat?—I should think we could bring it down to 114° or 115°. The remedy is a slight one, because very often the great heat will overcome the cool draught before it is in sometimes.

9516. Are you quite sure that the heat at the 230 fathom level does not exceed 115°?—I should think so.

9522. (*Chairman.*) How far have the miners to go from the end of the levels at the 230 fathoms and at the 220 fathoms for fresh air?—At the 230 fathom level I suppose they must go back and climb up above 20 fathoms, and go in from that place to where the level is, and if they go up 20 fathoms they will have very good air.

9523. Then they go to end after working to get fresh air every half hour or every hour?—Every hour, but perhaps they do not go where the fresh air is, they go up to one level where the air is better.

9584. (*Mr. Holland.*) In consequence of the high temperature they would be only doing three-fourths of the work that they would otherwise be able to do in cooler air?—Yes.

9617. (*Mr. Kendall.*) Have you many men in your mine who have been disabled from working in very hot levels?—There are four or five.

9618. I suppose you have more men who have become disabled from working in hot levels than from working in the cooler levels?—Yes. I do not know that we have one there.

9619. Is there any difference in the look of the men who work in the deep levels?—I do not think there is any great deal of difference in their looks. Perhaps the

(C.)—VENTILATION.

Tempe- very hot levels make them look a little more flushed in the face, and perhaps that is a bad sign.

9620. What is your opinion as to the general health of the miners?—I think that the general health of the miners is pretty fair.

9621. Your mine is the hottest mine in the county, is it not?—Yes, there is nothing like it, I think.

Capt. James Smith.

9841. (*Chairman.*) Is the mine granite or killas?—South Basset is granite, East Basset is killas.

9842. Is there any difference in the temperature of either mine?—Very little.

Mr. William Skewis.

11,950. (*Chairman.*) Is there any difference in the temperature of the levels where the lead and the copper are being worked?—Yes, there is a great deal of difference in the temperature of the level where the copper is. The copper is very much warmer than the lead. I mean that at the same level there is a difference; it is not so damp nor so cold in a copper mine as in a lead mine.

Mr. James Richards, Devon Great Consols Mines.

18,797. (*Mr. Holland.*) You said that some of your men were working in hot air?—The highest temperature which we have in any part of the mine is 70°, that is at the very deepest part.

18,798. You have no such temperatures as 90° or 100°?—No, the 70° is in the drivage from the shaft, at the 212 fathoms, in the shaft it is only about 50°.

18,799. Have you any places where the candles will not burn brightly?—Not any.

18,800. (*Mr. Kendall.*) The 212 fathoms level is suspended for the present, is it not?—Only for a few days longer.

18,801. In consequence of the temperature?—No. We are changing the pit work.

18,802. Was not the temperature very high?—It was 70°.

(c.)—THE DEADS AN OBSTRUCTION TO VENTILATION,

Mr. John Borlase.

c.) Deads Obstruction Ventilation

6162. (*Mr. Davy.*) Do you find the men sometimes come to complain of bad air, without cause for it?—Sometimes they will complain in consequence of a little stuff in the level. It is not at all times that you get the levels clear, and then you find the air a little light.

6163. Supposing a man came to you to complain of the air being imperfect, what would you do?—I should get it clear as quickly as possible.

6164. You would take notice of it?—Quite so. Being accustomed to it, and knowing what it is to be deprived of good air, we do our best to get the mine clear of all stuff.

6165. But you very frequently find that the air is not so good as it otherwise would be, in consequence of the neglect of the workmen in clearing the levels?—Yes, and then we use our authority, and make them clear the levels.

6166. Have you not been obliged to spale them for not clearing the levels?—Yes.

6167. Therefore if the air is bad it is from their own neglect?—Yes.

6168. Have you seen that frequently?—Yes.

6169. You say that you have spaled them for it?—Yes; but in this mine we set all our trammers and manage it ourselves.

6184. (*Chairman.*) What height do you drive your level?—Seven feet high.

6185. You say that sometimes the men have complained of the accumulation of stuff; would one day's work stop up the level sufficiently to impede the ventilation?—No.

6186. How often do the captains visit?—Every day. I have been down to-day to the bottom of the mine.

6187. If you saw stuff accumulating, should you not make the men remove it before it becomes injurious, as impeding the ventilation?—We do so. We have nine trammers in this mine, and we send them where they are required. We know every day where the stuff has accumulated, and we send them at once to take it away.

6188. That is not done in all mines?—No; in a good many mines the men wheel their own stuff, and they put it off as long as possible.

(C.c.) *Deads an Obstruction to Ventilation*

6189. If the agent who was properly looking after the mine saw that, he would not let it accumulate, though it was the men's duty to remove it?—No; he would insist upon its being removed.

6190. Therefore the agent was to blame as well as the men, for leaving it to such an extent?—We are sometimes obliged to be harsh with them to make them remove the stuff.

6191. Still if the agent had found fault with it in time it might have been removed?—Certainly.

6192. But your plan you think better?—Yes; we have nine trammers in this mine, and we keep them at work.

6193. I suppose that it comes to the same thing in the end as to expense?—Yes; a man who takes his work under the idea that he must pay for that, must have more for doing it, and in the other way it is taken off.

6194. So that it is not more expensive to adopt the better system?—No. I think the better system is of the most advantage, both for the men and for the mine.

6195. (*Mr. Kendall.*) Did I understand you rightly, that in some mines men are expected to roll away their own stuff?—Yes.

6196. And that in consequence of neglecting to do so at the proper time, a deficiency of air is produced?—Yes.

6197. An agent may remonstrate again and again, and tell these men to clear their levels, and they neglect to do so, and at last, when remonstrance is in vain, you are at times obliged to impose a fine on them before they will do it?—Yes.

9198. (*Chairman.*) But the agent could have imposed that fine on them before it got so bad as to impede the air?—Yes, if he liked to take harsh measures, but he does not like to do so.

6199. But if it is injurious to the health he ought to have done it?—Yes.

6200. (*Mr. Davey.*) You are here provided with trams upon all your levels?—Yes, all our levels are carried seven feet high and four feet wide all through the mine.

6201. But in many mines they have not trams?—No.

6202. And it is in places where they are obliged to wheel out this stuff that they get this bad air?—Generally so.

Mr. Richard Quiller Couch.

6462. (*Mr. Kendall.*) Have you been through deep levels?—Yes, and think that much mischief is caused by the men themselves, by their throwing the "deads" or rubbish in the levels, so as to block out the ingress of fresh air.

Mr. John Nankervis.

7258. (*Chairman.*) What happens when a captain goes down into a mine and he finds a level choked up with deads?—Then the miners are called to account, and they are told, "You must bring your stuff out or we "shall send people to bring it out for you, and keep "the money from you to pay for it."

7259. Does that often happen to you?—It happens occasionally; there is not a man hardly who is not liable to do it; they will leave it there sometimes at a sacrifice to themselves if they are not looked after.

7260. You mean, I suppose, that it will impede the ventilation?—Yes; and the men cannot work with the same vigour. We have to look into that, for when they are crammed up they cannot exert themselves with the same vigour.

7261. They neglect it, I suppose, in order to save the cost of removing it?—Yes; but if they got a boy or some parties to take it away they might do it twice a week or once a week, and we have to guard against their not doing it.

Capt. Stephen Harvey James.

7470. (*Chairman.*) Of course you never permit any accumulation of deads in your levels?—As little as possible; there are certain times when it will happen, but we calculate that it is cleared every week, or perhaps twice a week.

(C.)—VENTILATION.

Capt. James Phillips.

(C. c.) Deads an Obstruction to Ventilation. 11,698. (*Chairman.*) What precautions do you take to prevent the men leaving the deads to accumulate in a level?—We have a sufficient number of trammers and haulers to keep the stuff clear from the mine, so that no man is injured in the mines.

11,699. Do you do that, or is that part of the contract with the man who takes a pitch?—We set what we call the trammers to clear out all the stuff in the mine, and they do that every day.

11,700. Are those trammers paid by the adventurers, or are they paid by the men who take a piece of work?—They have so much a month to keep all the stuff clear in the mine.

11,701. Are the wages paid to the trammers deducted in the bal bill?—The tutwork men allow 10*s.* a fathom for tramming that stuff, and the tributors give a guinea for 100 kibbles; but that has nothing to do with the trammers, only we deduct this from the tutwork men's wages.

11,702. (*Mr. Holland.*) You pay them what you think a proper sum, and deduct it from the tutwork men's wages?—We give the trammers so much a month.

11,703. You fix the price paid to the trammers?—Yes.

11,704. (*Chairman.*) Do you think that that is a better plan than leaving it to the tutwork men and tribute men?—Yes, because there would be always grumbling; we find that it works better; we keep the trammers and keep the hauling machines.

Mr. James Richards, Devon Great Consols Mines.

18,841. (*Mr. Kendall.*) Can you give any reason for the goodness of the air in the case which you have before mentioned, which struck you as extraordinary?—Only keeping the level clear of stuff; we always find that a benefit.

(*d.*)—DUST.

Mr. James Seccombe.

(C d.) Dust. 1486. (*Mr. Kendall.*) Did you ever see an instance, or more than one, of the dust coming from the lode, in the working, so as to be injurious to the men?—I would not say that the dust might not be injurious.

1487. There is dust, is there not?—Yes, where you work upon a very mundicky lode.

1488. Where you are working upon a mundicky lode there is a very strong smell, is there not?—Yes; upon the punching of the hole there would be a strong smell; but that might be prevented by keeping a mop around the borer; that would keep away the dust, and deaden it.

1489. Have seen instances where the men have been negligent, and where there has been a good deal of dust from the ore which would be injurious to them?—I do not know whether there would be much from the copper ore; the mundic smells very much, if it is left to dry, and the dust is not damped.

1490. Where there is a good deal of mundic you think that a good deal of dust is caused?—I do not know that there would be more dust, but there would be more smell with it.

1491. But I am speaking of dust?—I think that, generally speaking, the men can prevent the dust from being injurious; they might at times throw a little water upon it, if they get into a very dusty place. Upon punching a hole with the bore at the commencement, and making an impression, the dust flies about, and if they kept a damp mop round it it could not come.

1492. Have you seen instances in which the dust does fly about?—Yes, but with care the people might prevent it.

1493. The dust is of such a kind that a person would inhale it by breathing it?—Yes.

1494. Unless you took care, you would inhale that dust?—Yes, some of it, there is no question about it.

A Miner.

1843. (*Chairman.*) And, therefore, there is a good deal of dust?—There is naturally dust.

1844. Do you think that you inhale that dust?—Yes; I had a very serious illness, for between two and three years I could not work at all. I never did a day's work for more than two years, and for years after I was unable to work again. I spat up a black substance, *(C. d.) Dust.* supposed to be the candle smoke and the powder smoke having been inhaled and lodged in the stomach or upon the liver, or something of the sort. For years after I declined working underground I spat up this black stuff.

A Miner.

1991. (*Mr. Austin Bruce.*) Have you ever remarked that you were breathing in an atmosphere in which there was much dust?—Yes,

1992. Do you think that you have been the worse for it?—A great deal the worse for it

1993. How soon did you feel the worse for it?—That depends very materially, of course, upon the kind of constitution of a man; hence I have been told by many medical gentlemen in the course of my time, when I applied to them, that if I had not been a man of extraordinary constitution I should have died.

1994. Did you feel it actually whilst you were at work?—Yes, I believe that I did; but I felt the effects of it most at the first place that I spoke of. After working in the end for some five or six months it was stopped for some time, and we commenced sinking a new engine shaft from the surface. After working there for, I think, two or three weeks, one night when I was engaged in work some bad sensation came over me, and something just like a swarm of black flies, as it were, came before my eyes, and, of course, I felt very unwell, indeed, and especially in my head, so that I had to discontinue working for some three or four weeks. I applied to a medical gentleman, and he told me that it was the effects of bad air

1995. Did you feel immediately the effects of the dust being in the air?—Yes; in the time of working you would feel it.

1996. Would a man going down in a perfectly healthy state, and working in air impregnated with dust, feel at once that he was breathing dust?—A man, without working at all, in a perfectly healthy state, if he was going into an end of that description, would feel it much worse than a man who was working in it.

1997. Would there be any marks upon your mouth of the fact that you had been breathing dusty air?—Frequently; in coming to the surface, frequently the nostrils and so on would be considerably furred with dust and smoke and so on.

Mr. Peter Clymo.

2323. (*Mr. Kendall.*) With regard to boring, does much dust arise in boring?—Yes.

2324. Injuriously to the men, in your opinion?—No doubt about it, particularly when you commence your hole. For instance, the men will hole, and the head, perhaps, is close to the bit where they begin to bore, and at every blow of the borer the dust flies all round, and they must be constantly inhaling it.

2325. Can you suggest any remedy for that?—No, I do not see what you can do.

2326. You refer to mundic and to copper and to slate?—Yes.

2327. In certain positions the men must have a dust, which is injurious to them?—Yes, because when you are working upon the lode, a miner will always do with as little room as possible, particularly if the ground is hard on each side; then you would be sometimes surprised to see the men, and you would be afraid that they were knocking their heads.

A Miner.

2789. (*Mr. Fulke Egerton.*) Did you ever feel much inconvenience from the dust?—Yes, a great deal in the chest. I felt tied up in the chest and the breathing

2790. (*Chairman.*) From what was the dust?—From the hole in boring.

2791. Did you feel it in your mouth, or how did you know that it was from the dust?—I spat it up, a great quantity of clots of nasty black stuff.

2792. Was not that powder smoke?—No. I have been working in places where we have not shot at all, and have brought it away just the same.

2793. In what mine was the damp which you have described?—We call the mine Scoble's; it is under the same company as Par Consols.

2794. Where was the dust which you spoke of?—We find it in every place where we work, not in one place only.

d.) Dust.

Mr. William Wale Tayler.

3698. (*Chairman.*) Would they be affected at all in their health by the dust from their clothes?—No, I think not; but there is one point which I forgot to mention, and I think that is a very important one, namely, that the miners, in working, necessarily inhale a great deal of small particles of copper.

3699. That is to say, that when they are boring at a dry end you think that they inhale the dust from it?—Yes, and that is injurious. A miner was telling me that he suffered so much in that respect, that he used to avoid opening his mouth, and breathed entirely through his nostrils, and he found a quantity of dust accumulated in his nostrils through doing so, which would otherwise, as he imagined, have gone down his throat

3700. Is that miner in the district now?—Yes, he suggested that it would be a very good thing if the miners were all to wear moustaches, that it might very much prevent the dust from entering the throat.

3701. Do none of them wear moustaches as a general rule?—I think that some of them do so, but not as a general rule,

3702. And you think that it would be the means of preventing dust from entering the throat?—Yes. It is very odd that the miner's breath should seem to be so strongly impregnated with copper; you can smell the copper as distinctly as possible; at times I have noticed it in the surgery, so that they must inhale a great deal of it.

3703. And it must be injurious?—Highly injurious, and it produces greatly bronchial affections.

3704 (*Mr. St. Aubyn.*) That comes from the breath, and not from the clothes, I suppose?—Not from the clothes at all.

3705. You are sure that it comes from the breath?—I am sure of it.

3776. (*Mr. Kendall.*) With regard to the dust, you spoke very positively; you said that you had not only seen it but had smelt it?—Yes; that is my decided impression.

3777. From the breath?—Yes.

3778. More than once?—More than once.

3779. Have you ever had more than one complaint about the injury which a man has received from the dust?—They do not consider that they receive so much injury, but they consider that they do inhale dust

3780. But do you consider that injury arises from their inhaling that dust?—I think so, partly.

3834. (*Mr. St. Aubyn.*) When you spoke of the smelling of copper from a miner's breath, did you mean that it arose entirely from the dust, in your opinion?—Yes.

3835. And therefore, to produce that smell, the miner must have inhaled a quantity of dust which must afterwards have decomposed in the stomach?—I suppose so.

Mr. John Pearce.

4017. (*Chairman.*) Have they ever complained to you of swallowing the dust in the mine?—Yes.

Capt. John Truran.

6377. (*Chairman.*) In chiseling out the centre part do they make a great deal of dust?—No doubt.

6380. (*Mr. Davey.*) You say that it is a sort of oily substance; would you get much dust from that?—The coating, as we call it, is very hard, and the end becomes filled with dust; that is, it rises very thickly about the men's faces.

6381. Do you find that that dust affects the men much in their breathing?—Not in their breathing, I think.

6382. How does it affect them?—It does not affect their breathing, I presume, immediately; but the miners are affected slowly. I do not think it is perceptible at first, not perhaps until several years have passed by.

6383. Are any of the men affected with what is called miners' disease?—Yes? some of them are.

6384. Do you attribute that to the dust?—Not altogether.

6385. (*Chairman.*) Two or three of your men have died lately, have they not?—Yes; not long since.

6386. Did you attribute their deaths to the dust or to any other cause?—We could not ascertain that, we had no means of ascertaining that.

6402. (*Mr. Kendall.*) It creates a small kind of dust; being so very hard?—Yes; it is ground out sometimes, when it is hard we grind it out; the chisel reduces it to an impalpable powder.

(C. d) Dust.

6403. Do you conceive that the men must inhale some of this powder?—There can be no question of it, I think.

6404. But whether that amounts to inhaling anything more than the ordinary dust you do not know?—It is nothing more; we suppose so.

6405. Have you fancied in your own minds that this dust has been injurious or not?—It is our impression that it is injurious.

6406. What do the medical men say upon that point, or have you brought it under their notice?—Yes, it has been mentioned to them; but they have never been underground; we mentioned it to Mr. Bolitho.

6407. Have you ever known a case of this kind, that a man has become ill while employed in chiseling out this stuff, and has been then sent to some other part of the mine where he has become better, and then upon being sent back again to the first place has been taken ill again?—The last who died in that neighbourhood was one of our miners; he was taken ill, and he remained at home for a little while. He came back again to work; we could not persuade him to give it up; and he then had a relapse, and he was very soon carried off.

6408. Have you ever had a man in your employment who was taken ill whilst employed in chiseling, and who was sent away under the idea that his illness was caused by that mode of working, to another part of the mine where there was no chiseling going on, and where he got better, and then returned to his former work and got worse again?—No.

Mr. Richard Quiller Couch.

6509. (*Mr. Davey.*) As a general rule, I suppose the men cannot be injured much by imbibing the dust in working?—Under the microscope I discover dust, or at least I discover minute particles of granite and of other rocks where they have been working, mixed up with the sputa. Dr. Peacock was down here, and I have at his suggestion taken the expectoration and placed it under a microscope, between thin layers of glass, and I have found minute particles of stony dust.

6510. That could not have occurred except in very dry ends?—No, at least I presume so; where the rock is struck, and it is dry, although it may get wet afterwards, a blow will produce a dry cut, and dust may arise then. But very frequently in the expectoration of the miners we find these minute particles of dust, as I may call them.

6511. (*Mr. Kendall.*) Did you ever analyse the ordinary expectoration of a man on a dusty day?—Yes, and I have found dust there as well, but not angular particles of stone.

6512. (*Mr. Davey.*) Are you aware whether the places in which those men worked were wet or dry?—No.

6513. (*Mr. St. Aubyn.*) Have you examined the expectoration of those miners who have been working in wet ends?—Yes.

6514. Have you found an absence of dust in their expectoration?—I cannot say that I have particularly noticed it, I have not entered it, whether they have been working in one or the other. I have given them a bottle with a screw top, and I have said: "When you "get to the service and you find any expectoration is "coming up, put it into this bottle, and screw it down, "so that no dust from the surface shall get into it;" and allowing for some getting in, yet the quantity has been greater than with the ordinary precautions would have entered into it.

6515. You say that you have examined the expectoration of miners who had worked in dry ends, and there you found minute particles of granite?—I should say that I have examined the expectoration of miners without reference to whether they worked in dry or in wet ends, and frequently find in the expectoration angular dust.

6516. You cannot say from your own microscopic examinations whether there is more dust in the expectoration of those who have worked in dry than in expectoration of those who have worked in wet ends?—No, I cannot.

Capt. William Rutter.

10,176. (*Mr. Holland.*) Would they wear it?—Yes, think so. I will give you my experience of dust

(C. d.) *Dust.* ground. I have found that neither working in a very wet place, nor yet in a dusty place, ever affected me I was years that I could not eat a bit of meat underground, having no appetite, but was quite well and hearty. I could jump into the scales, and pull down 9 or 10 score, after working 12 years, I have done it many times, and have been agent more than 30 years. Dust did not effect me, because I liked to work with my lips closed, and as soon as my nose got pretty well filled I out with it, but everybody does not do that.

10.177. (*Chairman.*) Why should not men let their beards grow, and wear a moustache?—It would be a very good thing. You know that Providence has put a net in their nose, a net that will catch the dust, and out with it.

10.178. (*Mr. Holland.*) Men who have not taken that precaution have suffered much more than you have?—Yes

10,184. Are the killas mines more dusty than the granite mines?—Yes, a great deal; because there you work pick and gad, and in the others you bore and blast.

Mr. Thomas Hutchinson.

10,591. (*Chairman.*) Have you any suggestions to make by which the causes from which miners suffer by working underground might be modified?—If the climbing up the ladders could be done away with it would be very advantageous; they evidently suffer from climbing, from want of ventilation, from the powder-smoke, and the dust If the levels could be made wide, these and the ends better ventilated, and the climbing cone away with, the condition of the miners would be much improved.

(C. e.) *Candle Smoke.*

(e.)—SMOKE FROM CANDLES.

Mr. James Seccombe.

1497. (*Mr. Holland.*) And not the other?—I do not know that it does; but the smoke from the candle will find its way into the throat, and colour the expectoration.

A Miner.

1844 (*Chairman.*) Do you think that you inhale that dust?—Yes. I had a very serious illness; for between two and three years I could not work at all I never did a day's work for more than two years, and for years after I was unable to work again, I spat up a black substance, supposed to be the candle smoke and the powder smoke having been inhaled and lodged in the stomach or upon the liver, or something of the sort For years after I declined working underground I spat up this black stuff.

A Miner.

1933. (*Mr. Kendall.*) A supply had come in?—There was a better supply; there was not the same foul smell The candles are generally not of the best kind; the wick of the candle is frequently made of hempy stuff, when it ought to be of the best cotton, We frequently consider that the candle smoke does us as much or more hurt than the powder smoke.

(C. f.) *Powder Smoke.*

(*f.*)—SMOKE FROM POWDER.

Mr. J. Seccombe.

1498 (*Mr. Holland.*) And the powder smoke?—Yes

1499. Is that frequently in large quantities?—Sometimes we have a great deal of smoke; but the more we can get the mine ventilated the better. In some places, make what blast we would, in a few minutes the place would be pretty clear to go into, but not in other places If not ventilated, the smoke would lie here, and remain there a long time, and the men would be working in it.

1500. Do the men often go back too soon after firing a shot?—Sometimes they do; sometimes they are very anxious to know what they have done, and they would run forward to see, and come back almost directly, just to see, and then come back and stop They need not do that; but then they are very anxious to know.

1501. How long is it common for the powder smoke to hang about?—That depends entirely upon the draughts. Sometimes it might remain there for an hour, and at other times it would not remain for five minutes. (C. f.) *Powder Smoke.*

1502. What is the ordinary time?—Perhaps five or ten minutes.

1503 Is half an hour an uncommon period?—I should say that it was very uncommon; that is, where a draught is pretty close, that is, to be injurious. Of course they might see a little of it.

A Miner.

1834. (*Chairman.*) Was there any difference on entering that end on a Monday morning from entering it on any other day?—Very much. In working on the other days there would be the powder smoke and the candle smoke which would be confined in the place; there not being a sufficient body of air, it would not live; it would die in the place; and on Monday mornings, of course, having been absent from Saturday, all this would naturally have gone away.

1835. How long should you suppose that the powder smoke, when you were working, remained in that end?—It was never clear of powder smoke from Monday morning until Saturday night, being continuously working through the week.

1844. Do you think that you inhale that dust?—Yes. I had a very serious illness; for between two and three years I could not work at all. I never did a day's work for more than two years, and for years after I was unable to work again I spat up a black substance, supposed to be the candle smoke and the powder smoke having been inhaled and lodged in the stomach or upon the liver, or something of the sort. For years after I declined working underground I spat up this black stuff.

Capt. Thomas Taylor.

5673. (*Chairman.*) When you are working below the 40 fathoms, does the powder smoke not hang at all?—Very little; it is scarcely anything; it is what you may term very good air. Of course it is not as clear as it is at the surface.

5674 In summer, when there is no wind, does the powder smoke hang for a quarter of an hour, so that the men are obliged to leave it?—No; we could go to work within a quarter of an hour at either end that we have got. We have three ends, one is a cross-cut. We have two ends driving on the lode.

Capt. Richard H. Williams.

6333. (*Chairman.*) How long is the smoke, after a blast, getting away from the end of the level where the men are working?—We found that in five minutes the smoke was gone sufficiently for the man to go to work, and in 10 minutes the air was perfectly clear; there was not the least smoke any more than there is in this room.

Capt. Charles Thomas.

8826 (*Mr. Holland.*) You stated just now that you were anxious that the men should not go into the ends before the powder smoke was cleared away, do you think that that is injurious to them?—Yes, very injurious; when it is very hot after a place has been blasted, there may be some carbonic acid then let loose, and that would settle down in a few minutes in the bottom of the level from being heavier than the common air; that is our notion about it.

8827. You consider that it is very injurious to go into an end shortly after a shot has been fired?—Yes, I find that it brings on cough; if I have gone in I have found that it disturbs my regular breathing.

Mr. Joseph Jewell.

9671. (*Chairman.*) Is there any difference as to the smoke that is made after an explosion?—Mr. Davey's powder at the commencement did not make so much smoke. I gave an account of that in a paper. I thought that the men might go in to work again in five minutes in an ordinary place, but I see very little difference now. I remarked it last week underground.

9672. Is the powder not so good as it used to be?—No; it makes smoke just like other people's powder.

9673. It would be an advantage to you, would it not, to have powder that did not make so much smoke?—Yes.

(C.)—VENTILATION.

Powder

9674. Do you think that the smoke is at all injurious to the miners?—I do not think that it does them any good.

Mr. Thomas Hutchinson.

10,591. (*Chairman.*) Have you any suggestions to make by which the causes from which miners suffer by working underground might be modified?—If the climbing up the ladders could be done away with it would be very advantageous; they evidently suffer from climbing, from want of ventilation, from the powder smoke, and the dust. If the levels could be made wide, these and the ends better ventilated, and the climbing done away with, the condition of the miners would be much improved.

Capt. John Taylor.

11,531. (*Chairman.*) What is the longest time that the smokes takes in clearing away from any one level or winze when you are sinking a winze?—Sometimes in some parts of our mine the smoke will remain to a certain extent for two hours, but it is smoke which does not injure—it is smoke which is cool because there is pretty good air; the smoke does not entirely go away, but it is cooled, it is not very thick.

11,532. In which level would that be the case now?—Our mine is in the moor principally; it is low, and the part in which the smoke stays the longest is called Hill's part of the mine—that is the deepest part of our mine; it is the 90 fathom part; but it will be all through the mine just a little mist for two hours. After blast in the morning it may remain for two hours before it entirely goes away.

Mr. William Skewis.

11,963. (*Chairman.*) How long should you say the smoke was in clearing out of a level that has been driven 40 fathoms without a machine?—It lies a considerable time in some instances, but there is no machine where the levels are driven a great distance; they are not without communication.

11,964. Before you put in the machine which is now working, do you know how long the smoke was going out?—No; I never timed it in order to see how long it was, but it has lain there for a considerable time before the miners could go into work.

11,965. How soon is it driven out now?—In about 10 minutes before the men can go in again.

11,966. How long is it before it is completely cleared away?—Perhaps half an hour before it is cleared away altogether, but it is cooled down now so that the men can go in in about 10 minutes.

(*g.*)—IMPROVEMENT OF VENTILATION.

(g.) Im- ement of tilation.

Mr. Richard Pascoe.

1735. (*Mr. Kendall.*) Do you think the mines are better ventilated than they used to be?—Yes, I do think so.

1736. Has there been great improvement in them in that respect?—Yes. I know that South Caradon and West Caradon have been considerably improved in the last few years.

A Miner.

2642. (*Mr. Fulke Egerton.*) In your experience do you think that ventilation has improved all mines?—A great deal in the last 20 years. The places which are extended horizontally are larger; they make them now for small tramways. Formerly they were only so that a little boy could pass through with a barrow. I think that the better the mine is ventilated the better it will pay the adventurers.

2643. The usual height of the levels is about seven feet, is it not?—Yes, usually; they ought never to be driven less than that.

A Miner No. 1.

2820. (*Mr. Austin Bruce.*) How long have you been working?—About 20 years.

2821. Should you say that during that time there had been an improvement in the mines?—Yes, a great deal, a very great improvement.

2822. Do you think that the young men who begin to work now will have a better chance of keeping their health than those who began to work 20 years ago?—Yes, a great deal better.

(C. g.) Improvement of Ventilation.

2823. For more reasons than one?—There is a great deal more circulation now than there used to be when I went underground first.

8824. And is more care taken about drying the men's clothes?—Yes, I seldom put up wet clothes myself.

Mr. John Pearce.

4112. (*Mr. Kendall.*) In those mines in which you are now extensively employed, is there much bad air?—No, I think that the ventilation, generally speaking, is very good.

4113. Are there many bad ends?—No; now that our agents have paid great attention to ventilation, I do not think that there is nearly so much bad air as there was formerly, and I do not hear it so frequently complained of.

A Miner, No. 1.

5900. (*Mr. Kendall.*) Since you can recollect is there an improved mode of ventilation?—Yes, I think there is.

Mr. Alfred Chenhalls.

7127. (*Mr. Kendall.*) As far as you hear, and from looking at the plans, do you think that there is much improvement as compared with past times, in the ventilation of the mines?—I should say that there is very considerable improvement.

7128. Are you of opinion that the mine agents think it not only economy, but the right thing to do, to have their cross-cuts more frequent, in order to provide better ventilation?—I believe that our mining altogether is carried on with greater consideration for human life both above ground and beneath the surface.

Capt. James Bennetts.

7709. (*Chairman.*) After you put in the water, how long was the smoke getting away?—The smoke would go away very quickly. I should say that it would all leave the place in half an hour.

7710. (*Mr. Holland.*) In one quarter of the time?—Yes.

Capt. Matthew Curnow.

8632-3. (*Chairman.*) Do you know any men who are alive who have suffered from working in the mines?—It is a very rare thing with us anywhere in the neighbourhood; during the last 10 or 15 years the mines have been getting better ventilated, and the health of the men is more studied now than it was 30 years ago; they study the health of the men, and one man thinks more of another.

Capt. William Rutter.

10,142. (*Chairman.*) You state that the men die prematurely; from what cause, should you say?—I think the general cause is debility; damp air underground. I paid attention to it for 40 years, more or less. Every day of my life I studied something about mining. I have been underground longer than that. It is very different now to what it was many years ago. We are more particular in driving our levels, and keeping a dead level in. We do not go up so much on an incline as we did, and we do not drive levels so far now, without sinking winzes, so that the mine is better ventilated. Another thing is, that the ladders and footways are much better; we have seats. When I was a boy we did not think of stopping anywhere; we ran 100 or 120 fathoms like a cat.

George Smith, Esq., LL.D.

10,326. (*Mr. St. Aubyn.*) You know that mines are better ventilated?—I know that mines are better ventilated now than formerly.

(*h.*)—MODES OF PROVIDING VENTILATION.

(C. h.) Modes of providing Ventilation.

Mr. Thomas Trevelyan.

1122. (*Chairman.*) Did they seem to you to answer?—They seemed to answer very well. I suppose that the air is not so good as the natural air. I question that, and it is not believed that it is so good, but still it is a great assistance.

(C.)—VENTILATION.

(C. h) *Modes of providing Ventilation.*

1123. What are the artificial means which you have seen?—Sometimes the air is forced with fans, with waterfalls, and sometimes it is done by fans worked by boys forcing it in, causing a rush of wind, and it is conveyed in by a close pipe.

1277 You have used the words "send a current of air." How do you send a current of air?—If we found that the air was coming out of a certain level, and we wanted to put it in further, if there was any winze or hole that the air would go down we would put in a door so as to prevent it, and send the current right on. We manage to get all the air that we can.

1278. You do put in doors?—Yes, sometimes, to prevent it going back again.

Mr. James Seccombe.

1383. (*Chairman.*) It is only while you are driving an end that you want those pipes?—Yes, but as soon as we get the winze through to the next level, that will do away with the necessity for them.

Mr. Richard Pascoe.

1772 (*Chairman.*) Has your mine got one of these machines?—Yes, we have done it by air sollars. We have thrown down good air 150 fathoms; we have thrown it by machines 120 fathoms, which I think would supply 20 men

1773. (*Mr. Austin Bruce.*) Would not that reach any close end that you have seen?—Yes, but those close ends may not have an engine. It might be so in little mines, where there is no engine.

1774. (*Chairman.*) If you had had an engine you could ventilate any close end?—Yes, anywhere.

1775. (*Mr. Davey.*) I think you stated just now that it was only the needy men who would work in those close places?—Yes.

A Miner.

1919. (*Mr. Kendall.*) Were any means taken in South Caradon of forcing in air at those bad ends?—Yes, there were many places, they had got a small fan machine, but frequently the air forced in by these fan machines is impure where they take it; they do not take it direct from the shaft; it is not so pure air as it should be; they take that air at a certain place in the level, when it ought to have been taken from the shaft generally, so that it is not pure air that is always forced in by these fan machines

Mr. William Cock.

2536. (*Chairman.*) At the end of that 100 fathoms what means of ventilation have you?—We have an air machine attached to the engine, a piston machine.

2537. How is the air blown down to the ends, is it in pipes?—Yes, the foul air is taken out.

2538. The effect is to draw the foul air out?—Yes.

2539. Are there two pipes?—There is another pipe.

2540. (*Mr. A. Bruce.*) Is that Struvie's engine?—It is a pumping engine.

2541. (*Chairman.*) How does it work?—It is attached to the engine, it works stroke for stroke with the engine; it draws out the foul air, and discharges through another rno of pipes to the surface.

2542. Is the fresh air sent into the mine by pipes?—No.

2543. You exhaust the foul air from the mine?—Yes.

2544. Does that plan answer perfectly?—It answers very well.

2545. Are there no complaints at the far end of this mine?—Not when the men keep the pipes in proper condition.

2572. Do you know what was the cost of this engine for exhausting the air?—I should think not more than 20*l*

2573. Is that much for such an engine?—Not a great deal.

2574. What horse-power should you think it would take to drive it?—I should think four or five horse-power.

2575. Do you think that could be applied to any mine?—Yes.

2576. From your experience of it, does it get out of order?—It draws about 200 cubic feet a minute.

2577. Has it ever got out of order?—Not since it has been working.

2578. From your experience would you recommend it to be adopted in mines where ventilation is required?—Yes.

(C. h) *Modes of providing Ventilation.*

2579. (*Mr. Davey.*) You stated just now that you had always good air in the mine as long as the pipes were kept in order?—Yes.

2580. Do the men sometimes neglect to keep the pipes in order?—Yes, they do.

2581. The consequence of that, I suppose, is that they a difficulty in working?—Yes. Those pipes are made in about nine feet lengths, and at the joints where they do not fit they are stopped up with clay, and by means of water sometimes the clay works out, and it requires to be renewed with clay or grease.

2582. Which the men, I suppose, neglect to apply?—Yes.

2583. Why do you stop up the parts where they do not fit with clay? Could you not find any other means of stopping them up better than clay?—Sometimes they are stopped with grease, and that would not wash out.

2584. As long as the pipes are properly attended to you get very good air?—Yes.

2585. Had you ever seen any of those machines before?—Yes.

2586. At what mines?—At West Caradon.

2590. (*Mr. Holland.*) What size is this ventilating engine?—Twenty-four inches square.

2591 What is the length of the stroke?—Eight feet

2592. That would be a 32 feet stroke?—Yes, it is double.

2596 How many strokes does it make a minute?—About three.

2594. About 200 feet a minute?—Yes.

2595 How many men does it supply with air?—Six, only two at a time.

2593. Is there a pipe that goes through the end to draw the air away from the end?—Yes.

2597. Does that connect with the division of the shaft?—Yes.

2598. Is the division of the shaft air-tight?—Not quite

2599. Is there an air pipe all the way up?—Yes.

2600. What size is that?—Five inches.

2601. It is a duck engine, is it not, like a gasometer rising up and down in a tube of water?—No, not with water, it is worked by valves similar to a steam engine.

A. Miner, No. 3.

2972. (*Mr. Austin Bruce.*) How many men are working in that shaft?—Six men; there have been nine.

2973. How many were there at a time in the shaft?—Three.

2974. Did all three suffer as you did?—Yes.

2975. Did you make any complaint to the agent?—Yes, we told him that it was very poor air, and that we could not work there.

2976. What did he do?—He then had this machine.

2977. Were you then able to work better?—A little after that.

2978. It was not good enough?—No.

2979. Did you then complain again?—Yes. He cased the shaft close and made it air-tight; he thought that it would throw air better by being air-tight, so that the air should play through any place; it was like two shafts.

2980. Did that improve the air?—When we had done a little the winter came in, and we had then better air, so that we have had no trial of it yet; this summer will be a trial for it, I suppose.

2981. Are you still sinking there?—No, we have stopped sinking now, but we are driving.

2982. You are driving an end, I suppose?—Yes.

2983 But the ventilation is good, is it?—Yes, it is very good air now.

Mr. John Pearce.

4123. (*Mr. Austin Bruce.*) You have stated that you have often heard complaints made by men engaged in working upon a rise of ringing in the ears?—Yes.

4124. Are those workings in portions of the mines which are reached for the purpose of ventilation by artificial means?—Yes.

4125. If sufficient ventilation were supplied there would be none of those painful sensations felt?—No, but as I have stated before they very often use wooden pipes to carry in air, and these wooden pipes become damp, and there is a difficulty then in throwing in pure air, as it takes in too large a quantity of moisture, and

(C.)—VENTILATION.

i) *Modes*
viding
ation.

in a close place where there are men breathing and candles burning, there is such a consumption of the atmosphere that you cannot have it so pure with regard to the oxygen as by natural ventilation.

4126. Have you had any experience in mining in addition to your medical experience?—Yes.

4127. But only as a shareholder?—No.

4128. Do you often go underground?—No; I have not been underground for years past.

4129. Do you believe that in all cases, the close ends are ventilated artificially?—I speak from my own experience here in the mines, and I know that that is the case, that means are always adopted where they can be to do that, perhaps a little more attention might be necessary, for they know the means, and they have it in their power to adopt them if they please, and if the men complain much I think the agents would be sure to do it.

Mr. Francis Barratt.

4607. (*Mr. Austin Bruce.*) If you had an up-cast shaft, with an air pumping engine at its mouth, you would have secured a current of air which would enable the men to go down at any time, would it not?—I think it would be an advantage to have an engine to exhaust the air.

4608. But in that case it would be necessary so to conduct the ventilation that it should not return indiscriminately to every shaft, would it not?—Yes; I think that would be an advantage.

4609. Do you see any reason why that could not be done?—A column of pipes could be put down, and the air could be exhausted by an engine above; but I would rather force the air into the mine.

4610. If you forced the air into the mine you would not keep a distinct up-cast and down-cast in the manner I have suggested, would you?—You could force the air into the down-cast and it would come up the up-cast.

4611. If you forced the air down the down-cast, might not a portion of the return air return up the very same shaft?—It is possible.

4612. Is not that a thing to be avoided?—Why so, as long as you supply the bottom of the mine with good air?

4613. Is not the object to secure a sufficient quantity of good air to all the workings?—Yes.

4614. And to make the bad air, that is, the air already breathed, pass to the outer air without returning through the workings through which it has already passed?—You could drive the air to the extremity of the mine by an engine forcing in air only, and continue your pipes. I would have branches to the bottom to let out the air.

4615. If you had a regular down-cast shaft, and a regular up-cast shaft, you would not require any pipes in the down-cast?—No, if you can make sure of your up-cast and down-cast.

4711. (*Mr. Kendall.*) Save and except in the mines which have been mentioned, would it be worth the cost, or would it be any particular service, to employ the exhausting engines which have been referred to; would it pay?—I prefer the forcing engines.

4712. Would it pay to employ them?—I think it would pay for deep mines.

4713. Your view is that in a very deep mine it would be better to employ a forcing engine?—Yes; it would lessen the temperature in the first place, and increase the volume of the air.

4714. And it would also, I suppose, save time with regard to clearing away the powder smoke?—Yes; no doubt of it. I would not let that air remain at the very bottom of the shaft; but have apertures in the pipe, so as to send it through and through and everywhere.

4715. It is a mere matter of opinion as to whether you should exhaust or force in; your opinion is that it would be not only useful to the men, but also economical for the adventurers, if they were, either by exhausting or by force pumps, to supply a current of air, not only in the main shaft, but throughout all the levels?—We tried the exhausting principle at East Crinnis for some years; we were advised to do so by the principal manager, and we found that we could not drive our levels very far, and we then changed and introduced the forcing principle, and we found that we could drive a considerable way further.

4716. As I understand you, all you require is this: that by some means enough air shall find its way into every end, and you would then let nature take its own course and let the air find its way out?—I do not care where it goes.

(C. h.) *Modes*
of providing
Ventilation.

4717. (*Chairman.*) You would send the air down with one pipe, and with branches from that to the different ends?—I would.

4718. Would that be a very expensive process?—I think not.

4719. What pipes would you use?—That would depend upon the extent of the mine, a foot diameter would carry a large volume of air; it is no new idea of mine; I have turned it over in my mind for years and years, and the result is that I would throw air to the bottom of a mine; I would not exhaust it. I would throw fresh air from the surface.

Capt. John Webb.

5323. (*Chairman.*) A fan worked by a boy?—Yes; or sometimes we work it with little water wheels if it is not more than two feet high, as well as by a boy.

5324. Will that introduce fresh air?—Yes; especially if we have metallic pipes through which we can deliver the air as good as we receive it, but if we have wooden pipes, wood is a consumer of air.

5325. In a dry mine, if the wood is dry, do you think that the air is injured by passing through wood?—Yes; I have observed wood in dry places throw forth a sort of moss or fungus, as it were, more than it does in wet places; when dry rot takes timber it is more offensive than it is when it is wet.

5326. Is it the case in mines that there is dry rot?—Yes; and it throws forth very poisonous vapours.

5327. Therefore you think that the air should not be introduced by means of wood?—No, unless it was well pitched over within; I suppose that that would be a sort of remedy, but that is not done generally.

5328. But if it was pitched over so that it could not decay, do you see any objection to the use of wood?—I think that that would be an improvement.

5329. It would be much less expensive than pipes?—It would be a little less expensive than metallic pipes.

5330. What kind of pipes would you recommend?—Zinc or galvanised iron would do very well.

5443. (*Mr. Kendall.*) With regard to your mines, do you principally use fans or water-falls?—The fans are the most direct and easy to be applied where we cannot have water-falls. We cannot have water-falls in one place out of ten.

5444. Where you have a water-fall, can you apply that waterfall to rises as well as to ends?—If you have, say a 10-fathoms fall, there is no better or cheaper means that you can apply than a water-fall.

5445. If you have a supply of water, you can direct that water-fall not only in your drifts, but in the backs and where the tribute workers are, and so on?—Yes; anywhere.

5446. Have you not an improved water-fall by Mr. Williams in your mine?—I have worked one in West Par for a long piece of ground. We were sinking 90 fathoms from the shaft, and we did it by a water jet; but there is not one case in ten where you can apply that. We must have a column of water in the shaft and pressure.

5447. It is not Mr. Williams's patent, but is an improvement upon the old plan, is it not?—No, I do not think that it is any improvement. It was suggested by some person up in the northern part of England, who came down here and suggested it.

5448. How long ago?—I should think four or five years ago.

5449. But a water-fall was used many years ago?—Yes; but this water-jet and a water-fall are two different things. A water-jet will do with a great deal less fall than a water-fall. With the water-jet you may take in a small stream of water, and it will give a pressure.

Mr. William Petherick.

5633. (*Mr. Austin Bruce.*) You do not think it worth while to imitate the coal mines?—I do not think it would be; I do not think it could be carried out.

5634. (*Mr. Kendall.*) I suppose it could not be carried out because there are so many shafts?—Yes; you are always altering.

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5635. Would not the quantity of tainted air in the up-cast shaft be very small as compared with the quantity of pure air in some of the shafts?—Very small indeed; you are always coming in contact with the levels coming out of the shaft

5636. Therefore, I presume that the miners would not be so much affected by the tainted air in the up-cast shaft?—No.

5637. (*Chairman.*) If there are only two shafts, or only one shaft, in a mine, would not the quantity of poor air and powder smoke be greater than where there are many shafts?—Certainly, vastly greater.

5638. So that if there were two shafts, and the impure air was coming up one, you would sensibly feel it?—Yes, that would be the case.

Capt. Richard H. Williams.

6312. (*Chairman.*) I believe that at my request you have been making more particular calculations as to the way of working, the cost of putting up, and the general expense of your plan of ventilation by water, as described to the Commissioners on a former occasion?—I have.

6313. Will you describe your plan?—I sent your Lordship a tracing of it. I think that I described the height of the fall in my previous evidence. The water has a fall of 80 fathoms through a pipe of 1 inch and 1¼ inch diameter.

6314. (*Mr. Kendall.*) What sort of pipe?—Gas piping. The cost per foot of that pipe is for the 1¼ inch 5½*d.*, and for the inch 4½*d.* per foot. The pressure of water at the bottom of the fall of 80 fathoms is over 200 lbs. to the inch. The air launder in which a jet is placed is 14 inches square at the mouth and 8 inches at the discharge end, connected with which are galvanized iron pipes of 7½ inches diameter, costing 4*s.* 9*d.* a fathom. The quantity of water required to keep the machine at work is 11⅔rd gallons per minute. The cost of pumping that water up out of the mine is 1¾*d.* per hour. The temperature at the point of ingress of the air when the machine is at work is 71 degrees, that is taken on a mercurial gauge, at the point of egress it is 77 degrees. After the machine had been stopping six hours, the temperature at the point of ingress was 71½ degrees, and at the point of egress 78 degrees. From the point of ingress to the point of egress of the air it is 50 fathoms. There is no winze or communication for 50 fathoms. I believe that those are all the particulars.

6315. How do you ascertain the cost of pumping?—I make up the total number of gallons which the engine is pumping per hour, then, taking the quantity of coals which it is consuming per day, I reduce it to hours, and then ascertain the value of the coals and bring it into pence, and dividing that by the number of gallons will show the cost per gallon of lifting the water.

6316. (*Mr. Holland.*) Does that include all the expenses; there are other expenses besides coal?—I take all the expenses. The items of expense in the pumping charges are, coals, candles, oil, tallow, gaskin, and cotton waste. I have worked this apparatus for the last eight or ten years myself

6317. (*Mr. Davey.*) What is the name of the mine?—The Charlestown United Mines is where his lordship saw it; but I have also worked it at St. Austell Consols Mine.

6318. What mines are the Charlestown Mines?—Tin.

6319. Do you not always find the air very much cooler in tin mines than in copper mines?—Yes.

6320. (*Mr. St. Aubyn.*) Is the apparatus still working in both those mines?—Yes.

6321. (*Mr Kendall.*) What is the greatest distance that you have ever been able to throw air with that machine?—The greatest distance that I have ever required it has been 100 fathoms; but I have put a rise through to the Charlestown mines 20 fathoms, and the commencement of the rise was 80 fathoms off the point from which we took the air.

6322. From your jet?—Yes; and we put the rise through 20 fathoms under the lode.

6323. Whilst you were going through that distance of 80 fathoms and progressing with your rise, was the air invariably good while that engine was at work?—Yes; very good indeed.

6324. There was no complaint?—None at all.

6325. There was no dull burning of the candle?—Not the least.

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6326. (*Chairman.*) Therefore, in your opinion, where a winze is driven merely for ventilation it would be much cheaper to put this pipe than to sink a winze?—Yes.

6327. (*Mr. Davey.*) Have you ever tried it or seen it tried in a copper mine?—No; although about three years since I sent a part of the apparatus, namely, the rose and the cock part, to Captain Richards of the Devon Great Consols, and also a drawing of it; whether he fixed it there and used it I do not know, but I believe so. The only difficulty which there is to contend with is having a point at which you can take off good air. There is no difficulty with this machine in throwing in the amount of air.

6328 But you must first get it from a shaft where there is an abundance of air to spare?—Yes.

6330. (*Chairman.*) What is the cost of the galvanized pipe?—I am giving 4*s.* 9*d.* a fathom for a 7½-inch pipe.

6331. You could make that to draw air down to the jet as well as to throw it?—Yes. With the first machine which I put in I took the air 30 fathoms above the level. The machine is working 124 fathoms under the adit level.

6332. How far is the furthest end from a shaft and from ventilation, where this is at work?—Fifty fathoms.

6334. (*Mr. Davey.*) In fact you force in air?—Yes, from the great velocity with which the air is sent through the pipe, it is as it were condensed; the air goes in in a larger volume than its actual contents, according to the weight of the atmosphere, from the great velocity with which it passes through the pipe, so that when it comes to the end it expands. I think that the forcing in of fresh air is advisable

6335. (*Chairman.*) Have you any doubt that the process of ventilation would keep cool the end of a copper mine?—I have not the least doubt of it, if the air could be taken away from a shaft.

6336 If a pure supply of air is introduced at one end behind the jet you think that it would be sufficient to cool a hot end?—I think that it would cool it to a certain extent.

6337. (*Mr. Davey.*) Could you get air from the surface? In many of these copper mines it is impossible for you to get cold air to blow in, it is always hot, could you draw air down?—For a given distance, I think you could.

6338. To what extent do you think you could do it?—I have done it for 30 fathoms; but of course we should have to force down the atmosphere, which has always a tendency to ascend. If pipes were constructed to the surface from the end this jet would not be required, because the action of the atmosphere would play of itself, the rarefied atmosphere of the mine would ascend through it, provided the pipes are continued up some 30 or 40 feet above the level of the top or collar of the shaft.

6339. (*Chairman.*) We want it the other way?—This could draw out the air from the end instead of drawing it in. I have been in a mine to the 240 fathom level, to the bottom of a shaft where the air has been quite cold, and the men have been filling the kibbles with their jackets on. I have stepped from that shaft into an end where the temperature has been 97 or 98 degrees. No machine of any kind was used when I went into this end. The level was suspended. I have no doubt my jet would reduce the temperature and enable the men to work with comfort.

6340. (*Mr. Kendall.*) What mine do you refer to?—Fowey Consols.

6341. And you have found that at 240 fathoms deep, in some of the main shafts, it was actually cold at the bottom?—Yes; I have come out of the main levels and have buttoned up my coat.

6342. (*Chairman.*) There your machine would supply good air?—Yes; but in the case of cross levels, perhaps the heat would be something like 80 or 85 degrees; but then, I think that with this jet, blending the water with the air cools it. The water is a sort of mist, it is something like a steam, the water is almost decomposed as it were, so that it cools the air. I believe that the air coming out at the end of the pipe is colder than that which enters it.

6343. (*Mr. Kendall.*) What is the distance of the jet of water?—From 20 to 30 feet, and ejected with great force.

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6344. (Mr. Holland.) Have you tried any other form of jet than that?—I have tried larger ones, but I find the size used to answer the best.

6363. I understood you to tell us that by the use of a jet the temperature of the air sank from 78 degrees to 71?—No, it increased from 77 degrees to 78. It was only one degree increase of temperature after stopping six hours. Then the machine had been idle only six hours.

6364. Did you notice the temperature of the water?—No, I did not.

6365. Would there be much increased cost in bringing cold water down instead of the mine water?—That would depend very much upon circumstances. It would be a very great cost to be brought down from the surface in a very deep mine, but then you generally get at some point in the mine water moderately cool.

6366. Could not you get water trickling down the shaft, which is mostly surface water, at a temperature of about 40 degrees?—Yes, 40 to 45 degrees.

6367. If that was got it would lower the temperature in the mine?—Yes, undoubtedly, and there is no doubt that the air going out at the mouth of the pipe is of a much lower temperature than what is going in, because the water is cooling it. The water absorbs any excess of impure gases contained in the air.

6368. What is the quantity of air driven in?—About 2,000 gallons of air in a minute. I have only roughly estimated it.

6369. That 2,000 gallons of air in a minute is driven in by 12 gallons of water?—Yes.

Note on 6338. I cannot see any necessity of drawing down air from the surface, as all mines have good air in the main levels, although thick and hot. Yet a candle will burn well and bright. The water jet, as I have constructed it, so blends the air and water together, that it cools the air, and entirely frees the air of powder smoke; consequently, I think, if in the ends of our deep mines we could get the air equal to what is passing through the main levels, the evil would be cured, and the ventilation as far as practicable made perfect. I beg to call particular attention to the testimonial I have received of the effect produced by one of these machines I have recently supplied to Great Wheal Baddern Mine.

Mr. Alfred Chenalls.

7160. (*Chairman.*) You say that the improvement in the ventilation of the mines has been very considerable of late years, in what way has that improvement been effected?—By sinking winzes within shorter distances, and in fact from a greater consideration for life than formerly was shown; but I believe that it has also been helped to a considerable extent by the employment of waggons upon railroads underground. It is well known that where waggons are employed the circulation of the air caused by the waggon passing half a dozen or a dozen times through a level is very considerable, and much more than where the air has not been circulated by any such movement.

7161. Then it is the circulation of the air in the mines that has been increased?—Yes.

7162. Has the passage of the waggons through the levels had any effect in getting rid of the foul air from the mines by driving it out?—Unless you move the air it would otherwise lie sluggishly underground, as a dead, damp, and poisonous atmosphere; it would continue there for perhaps any length of time; but the waggons by moving backwards and forwards have vastly improved the air.

7163. So that what you consider improved ventilation is a more free circulation of the air underground?—Yes, getting away the bad air and helping in the new. In all changes of that kind a beneficial effect is produced.

7165. Therefore at times, when the wind does not set in that direction, or when there is not much wind, the ventilation would be more imperfect?—It would not be so good. The Commissioners will have information given to them as to the Levant mine, they get the circulation on to the ends extending furthermost under the sea. They have put down upon the winzes between the shaft and the ends a sort of doors one after another, so that they have not allowed the draught to pass until it was sent on to the very extreme end, almost to the last winze in the end, and there they have made it a chimney.

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7166. In the levant mine they have used means to direct a current of air through it?—Yes.

7170. In other mines which do not run under the sea, do you think that the shafts and winzes provide sufficient ventilation?—Yes, I am satisfied that there is nothing wrong in that respect.

Capt. Stephen Harvey James.

7466. (*Chairman.*) Do not you think it possible that parties driving an end away from a winze where the draught is up are of opinion that the air is improved when it is not?—No. I think that they can tell it pretty well; but we have another mode, we put in a door to send the air into the end.

Capt. James Bennetts.

7703. (*Chairman.*) Then you have never had to use any artificial means?—We have in North Levant but never in the Spearns Moor. In the North Levant we have had to force air into one end by a fall of water, but the air was very pure in the end when it was forced there by water.

7704. But not before?—Not before. The men could work there and keep the light very comfortably, but we thought it our duty to put as good air there as we possibly could.

7705. Did the candles always burn upright?—Yes, as much as half a dozen at the same time.

7706. And yet you thought the air was not so good as it ought to be?—Yes, we found it out by blasting; when the holes were blasted the smoke would remain a good while, and by putting this air in the smoke would be driven out quickly.

7707. Before you put in the air how long did the smoke remain?—I suppose that it remained for two hours before it got altogether out.

7708. But the men would get in to work before that?—Yes.

Capt. William Hollow.

8013. (*Chairman.*) What mode have you adopted?—We have a cylinder, what we call a piston, and we pump air through pipes.

8014. From the engine?—From the engine. Our engine is always going from eight to ten strokes a minute; that is only just for the present moment when we have to ventilate any particular winze or shaft.

8015. From that it is carried by what kind of pipe?—By an iron pipe through the levels.

8016. To the point where the men are working?—Yes.

8017. Do not the iron pipes corrode very much?—No.

8018. What is the size of the pipes along the levels?—About five inches.

8019. How near can you carry one of those pipes to the point where the men are working?—Within about two fathoms, just out of the way of the blasting; in fact we have had them in the mine for the last two years and they have not been used; they are only used on very particular occasions.

8020. But you have the means of forcing in air when it is required?—Yes.

Capt. Charles Thomas.

8694. (*Chairman.*) Do you employ any artificial means otherwise than by winzes and shafts to ventilate Dolcoath?—At present we do not? we have occasionally done so. We had six months a fall of water of 10 fathoms deep, which was forced in through air pipes for a short period until there was a communication made. Now we have no artificial means.

8698. In any of the other mines have you had to employ artificial means to supply air?—Yes; in West Wheal Seton now means of that kind are occasionally used. We have had a fan to force in air, and a kind of plunger to force air in with. When we have a long way to drive it, it is occasionally worked by the steam-engine; it is a simple apparatus—a box swimming with water, where there is no friction at all, and that is a very efficient mode of sending in the air; it is a box turned upside down in another, or a cistern turned upside down.

8699. (*Mr. Holland.*) Are you speaking of a duck-engine?—Yes.

8713. (*Chairman.*) You think that the machine you have described for supplying air is preferable to the fan

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machine?—Yes, for long levels especially; it requires less labour to work it, I think.

8715. And it can be worked by any machinery you like to attach to it?—Yes.

8854. (*Mr. St. Aubyn.*) What, in a few words, should you say was the best means of improving the ventilation so as to make it as good as it possibly could be under present circumstances?—Where they have got a sufficient number of shafts, the best thing I think is a fall of water, when you can have it, and the next best thing is that instrument which I have partially described for forcing air in.

8855. To which there is a cistern?—Yes, but it must be always fixed in good air, great care must be taken about that, or else bad air will be blown into the men after all.

8867. (*Mr. Kendall.*) And where it is not good, by various contrivances, such as waterfalls, and the particular machine to which you have referred, and occasionally the fan machine, you are able, before you can have natural ventilation, to throw in a fair supply of air to the working miners?—We have the means of doing it, but it is not carried out so perfectly on all occasions as it ought to be; I acknowledge that fully; we have not perfected the means that we have now within our reach.

Capt. Thomas Richards.

9010. (*Mr. Davey.*) Which do you think is the best?—I generally make it a rule to take up my air in a good place. Say, for instance, that I was going to drive a 100 fathom level, I should not go out the 100 for the air. I would go to the 70, or 80, or 90. I would take up my air where it is good, and send it on; it is of no use to take the old air again. I have used lime (which I have found a very good thing) in the mouth of the pipe to improve the air.

Mr. John Richards.

9456. (*Chairman.*) In what manner is the air carried into these close ends?—By what we call winzes; we communicate there at every 12 fathoms; we put down a shaft and throw every particle of fresh air that we can down into the level, so that it may ascend up.

9512. (*Mr. Kendall.*) If you could introduce a stronger current of air would not that reduce the temperature?—Yes; I should think it would.

9513. Is it not the expense of bringing it down that stands in the way?—Yes.

Mr Joseph Jewell.

9706. (*Mr. St. Aubyn.*) Can you suggest any means for improving the ventilation in the mines to a greater extent than it is already improved?—I do not know that I can; it is generally owing to the shafts being sunk at the proper distances, and to winzes being sunk in the intermediate ground.

Capt. Joseph Cock.

10,000. (*Chairman.*) In cold damp, is it worse on a Monday morning when the men go to work, or after they have been working?—In some places, it just depends upon the air coming there. I have worked in places where we have been obliged to drive the air out before going to work. We go up with a jacket, and beat the air entirely out.

Capt. John Hancock and Mr. Michael Morcom.

11,205. (*Chairman.*) Is the air at all close at the end?—No, it is very good indeed. We have pipes to carry in to blow away the smoke from the men.

11,206. By means of a boy at the end?—No, there is a trap door, and there are air pipes.

11,207. From another level?—From a level above.

11,208. How long is the smoke getting away?—They can go into the end in five minutes after they have fired the hole.

11,209. So that by trap doors you conduct a current from other levels down to the point where you are working?—Yes, by a trap door and pipes.

11,210. Do you use any other means for forcing in air?—Yes, we blow a machine occasionally, if we find it necessary, but that is very seldom; we have so many shafts that it is not required.

11,211. By a proper management of trap doors and pipes you can conduct the air to any part of the mine?—Yes, we have very good air indeed throughout our mine.

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Capt. James Phillips.

11,678. (*Chairman.*) In what condition is the air at the end of the 115-fathom level; do the candles burn freely?—They burn very well. We have put in, until we have ventilated another winze, air pipes to draw out the foul air from there, so that the end is ventilated very well.

11,679. Do the candles burn without being tilted on one side?—Yes.

11,680. What machine is it that you use to draw out the foul air?—It is a duck machine, and it is worked by the same rods as the water wheel, and it draws out the foul air instead of forcing air in.

11,681. You produce circulation by drawing out the air?—Yes.

11,682. Is that machine applied to any other level?—No, it is not in the mine.

11,683. In the 130-fathom level how far are you driving from any winze?—I suppose we are about 20 fathoms from the shaft.

11,684. Is the air so good there that you have no need to use any artificial means?—We do not want anything there; the air is very good there.

11,685. Does the duck-engine answer for drawing out the bad air?—Yes.

11,686. Do you approve of the plan of extracting the foul air in preference to forcing in fresh air?—Yes; I have proved it in our mine a great many times, because in forcing in air you have a little fresh air along the end; and if the foul air is so heavy that the fresh air has not strength enough to drive it out, by taking out the heavy smoke and the foul air, the fresh air goes in.

11,687. Where does the fresh air that takes the place of the foul air come from?—We have ground stoped away about our shaft (the western shaft) in the mine, and there is a very great current of air from the surface down; there is a down draught of fresh air from the surface.

11,688. And that is the air that takes the place of the foul air?—Yes, it goes into the 115 fathom level as we take out the foul air.

11,689. According to your experience the powder smoke does not take so much time to clear away as if you forced in fresh air?—No; what we call the air pipes, when we shoot into these ends, drive out the powder smoke directly.

11,690. How long after the blasting is the smoke cleared away?—I suppose in our 115 fathom level the men can go in and work comfortably in 10 minutes.

11,691. How long is it before the smoke is completely cleared away?—It does not stay long, not when we have got the pipes all in good order.

11,692. How long do you think the smoke would remain without the use of those pipes?—Sometimes it would stay a good while; I dare say you could not calculate upon going into work again under half an hour, or three-quarters of an hour, and in some places an hour.

11,693. In point of economy does it answer to extract the foul air and the powder smoke, so as to get the men in to their work again quickly?—Yes; but we do not only convey these pipes into the furthest ends, we calculate to ventilate by winzes if it is necessary to drive away; and, when there are several men in a level, to put in these pipes, and instead of sitting down for an hour, they sit down for only a quarter of an hour, and they are able to do more work.

11,757. (*Mr. Holland.*) Would the 115 fathom level be hot if there was no blowing engine used?—No, not very hot, but our mine is not very hot at all, it is not the depth to be very hot.

11,758. How large is the duck-engine that you employ?—It is two feet square.

11,759. What length of stroke is it?—Seven feet.

11,760. How many strokes a minute?—Our wheel is going about four strokes a minute.

11,761. It has only one action, I suppose, and only draws when it lifts?—No.

11,762. What number of men are working at the end which it ventilates?—There are two pairs, twelve men. There are two working together at the end. They are not working more than four men together. There are 12 men, but they do not work more than four together. They work four in the forenoon, four in the afternoon, and four in the night. There are 12 on, but only four

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work together. I think that this drawing machine is about two feet square.

11,763. Do you find that the duck-engine is enough to keep the miners well supplied with air?—Yes, there was very good air before it was put in: it was put in to draw out the powder smoke and so on.

11,783. (*Mr. Davey.*) What sized pipes do you work in the duck engine at the 115 fathom level?—Four-inch pipes, I think.

11,784. Do you find that they are sufficiently large to draw the air from a distance of 40 fathoms?—Yes.

11,785. How close are they in to the end?—They are not within, I suppose, 10 or 15 fathoms of the end.

11,786. Do you find that you can withdraw the foul air that distance from the end?—Yes; you cannot get them right into the end. The men are working in the back, and if you do get them right into the end, they all knock them up.

Capt. Zacharias Williams.

11,815. (*Chairman.*) Where does it come from?—It comes through the level from one shaft to another; then we have to make everything convenient, to put a trap door into this level, and we have pipes to carry a rush of air into this end, so that it is as comfortable to work in as it would be here as to the air.

11,816. How long is it before the powder smoke is cleared away?—Perhaps ten minutes or a quarter of an hour.

11,817. How long is it getting away altogether from that level?—It is but a trifle of time; there is as fine a draught as you would wish.

11,818. You introduce fresh air by means of pipes?—Yes, into this end.

11,819. Of what size are those pipes?—Four inches in diameter.

11,838. Do you think that forcing in air is a better plan than extracting the foul air?—Yes, I do.

11,839. Does the powder smoke clear away quickly?—Yes.

11,840. Have you ever tried to exhaust the air as well as forcing it in?—No; we never made a trial of that.

11,841. When you have found the air beginning to get close, have you employed any means for forcing in air?—Yes.

Mr. William Skewis.

11,954. (*Chairman.*) How far do you drive from any winze or shaft?—We have never driven, I think, beyond 40 fathoms; in the lead mine we have driven, I think, something like 80 fathoms, but there we have an air machine.

11,955. Is the air machine employed to force in air or to take out the foul air?—It is used for forcing in air.

11,956. Did you ever try a machine for the purpose of drawing out the foul air?—We have not.

11,957. Is it your opinion that forcing in air is the best means of ventilating?—I have never tried the other.

11,958. Do you find that the plan of forcing in air is quite efficient?—Yes, we do. We have always applied the pumping engine to force it in. We do not use water generally. We have a machine attached to the pumping engine.

11,959. Do you force the air down the shaft through pipes?—We apply the air machine at about the same level, or a little above the same level.

12,035. (*Mr. Holland.*) How much does it cost to work an air engine, 1*l.* a month?—In working it with the pumping engine 1*l.* a month would more than pay it. If we worked the engine by hand, and employed boys to do it by hand, it would perhaps take 3*l.* or 4*l.* a month.

12,036. Suppose it cost 3*l.* or 4*l.* a month to work it by hand, would it yet pay by the saving that would be effected in the driving?—Yes, the saving would be more than three times that.

12,037. In every case in which there is a palpable deficiency of good air without the use of an engine, it would pay to put one in, although it would cost 3*l.* or 4*l.* a month to work it?—Yes, it would pay well then. You cannot work at all without them in some instances.

12,038. I suppose when you can work an air engine with the pumping rods, it is a very small expense?—The expense then is a mere trifle; when you can attach it to the pumping engine it can scarcely then be considered any expense. In some instances you have an opportunity of putting in a waterfall at no expense.

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12,039. Which would be the cheapest, a waterfall, or an air-engine worked by the pumping rods?—The waterfall would be the cheapest. It depends upon the circumstances. If the water must go down the shaft then it would be a little cheaper.

12,040. If the water would run away by the adit it would be hardly any cost at all?—It would be cheaper to work with steam power.

Mr. James Richards.

18,805. (*Mr. Kendall.*) How deep have you to sink before you communicate?—We shall sink to the next level, say about 12 fathoms. The shaft and the winze are about the same depth; they are going together. We have an air machine now working in the shaft to supply the winze with air; the shaft is in the country, and the winze is going down into the lode; we have a powerful air-machine to supply this place. The temperature is nothing like 70° now.

18,806. Is it warm at the 103 fathoms level?—No; it is very good air.

(*i.*)—FAN WORKED BY ENGINE.

(C. *i.*) *Fan worked by Engine.*

Mr. James Barkell.

838. (*Chairman.*) What length of levels have you?—I suppose that our longest drive from the shaft is about 160 fathoms. I am not certain; you can see pretty nearly upon the plan.

839. What is the greatest depth?—One hundred and sixty-six fathoms on the underlie from the surface. Our shaft is diagonal; we have no perpendicular. We have two air machines working a small shaft.

840. At the surface?—Yes.

841. How are they worked?—By a steam machine.

842. (*Mr. Holland.*) Is that a large duck-machine?—They are twisting machines of 20 inches diameter; those two air machines send in about 400 cubic feet of air in a minute.

843. (*Chairman.*) Do you find that this provides sufficient ventilation?—Yes.

844. (*Mr. Holland.*) For how many men?—We have never any complaint of air.

845. (*Chairman.*) Is the air good at those levels?—Very good indeed.

846. Do the candles burn there?—Yes, we never have any complaint.

847. The men have never complained?—No.

848. Are the engines constantly going?—They are always working.

(*j.*)—FAN WORKED BY A BOY.

(C. *j.*) *Fan worked by a Boy.*

Mr. James Barkell.

913. (*Mr. Fulke Egerton.*) What is the expense of this artificial ventilation; is it an expensive apparatus?—No; it is merely a 20-inch square cylinder. I should say 6*l.* or 8*l.*

Mr. Alfred Chenhalls.

7174. (*Chairman.*) You bring the air in from the surface?—It is brought in through the adit level. We are driving an adit to intersect the lodes which we believe to be before us; we are in this way doing our very utmost to avoid being compelled to sink a shaft for the purpose of extending this level, and cutting these lodes.

7175. What is the machine that you employ to force in air?—A fan.

7176. How is that fan worked?—It is worked by a boy, I think, turning a wheel.

7177. Where is the fan placed?—It is placed in the level underground, opposite the tubes that convey the air into the level.

7178. How near is any place from which the air is obtained?—There are shafts coming down to the adit.

7179. How near is it?—The fan is placed where another adit intersects, and where there is a considerable quantity of air coming in.

Capt. William Stevens.

8137. (*Chairman.*) Had you any means of cooling that end while the men were completing the other fathom?—Yes; We have put in an air machine.

8138. What description of air machine?—A fan

(C. *j.*) *Fan worked by a Boy.*

machine we term it, and with boys to work it to blow in air.

8139. That I suppose is put near the winze?—Yes; it is put where we can take up good air from.

8140. And 20 or 30 fathoms from where the men are working?—Yes.

Capt Charles Thomas.

8713. (*Chairman.*) Do you think the fan is an efficient mode of ventilating a level?—It will do for short distances. I should prefer a plunger or one of those simple little machines that I have described for forcing the air through a very long level.

(C. *k.*) *Water Blast.*

(*k.*)—WATER BLAST.

Mr. Richard H. Williams.

4322. (*Chairman.*) What means do you adopt to supply air?—I have adopted for some years in the mines a water jet with very great success, that is, driving in water by means of high pressure, and the water is discharged through a small rose, similar to the end of a watering-pot, and that is thrown in through a larger wooden pipe, which forms a kind of natural vacuum, and so the supply is kept up to the end by continuous tubes.

4323. Made of wood?—Yes, all made of wood; or we could use cast iron, or galvanized iron; we find that the wood absorbs the oxygen to a certain extent, and consequently deprives the air of it.

4324. As you go on, do you extend your tubes?—Yes.

Capt James Bennetts.

7713. (*Chairman.*) Can you describe the fall of water; how it managed to give this supply of air?—The fall of water is 18 fathoms; it falls and there is a pipe leading off from the cistern, the water falls into a cistern and it forces the air into iron pipes, and when it enters the pipes there is no other way for the air to escape until it goes to the end. The water rises to the top of the cistern and runs over, and the air is forced into the pipe, and there is no way for the air to escape but to the end of the pipe where the men are working.

7714. And you found that that gave complete relief?—Yes; the launder is four inches square, the pipe is sometimes nearly full of water.

7715. The air is carried by a pipe to the end?—Yes

7716. How far have you ever carried it?—We have worked, I suppose about 90 fathoms.

7717 With a pipe of an 90 fathoms from the fall of water?—Yes.

Capt. Charles Thomas.

8700. (*Chairman.*) At this moment have you any of these cisterns at work at West Seton, or at any other mine?—At West Seton now we have nothing but a fall of water for two rather long levels, and that is most efficient when we can have it; there is nothing equal to that.

8701. That is in two levels that are at work now?—Yes,

8702. Which are those levels?—The 82 and the 90.

8703. Can you inform the Commission what quantity of water is sent down or what quantity of air is supplied?—Perhaps 20 gallons a minute: I think so.

Capt. John Daw.

9255. (*Chairman.*) How are they ventilated?—We have a waterfall; a height of water falling into a pipe, and that throws in a very good stream of air, and we shall do away with that in the course of a month or two. We shall communicate from one to the other, and shall have one ventilation all through.

Mr. Joseph Jewell.

9654. (*Chairman.*) Do you not require any artificial means for the purpose of throwing in air?—Sometimes we throw it in by a waterfall; the places get a little warm in 18 or 20 fathoms.

9655. Have you got that at work at present?—We have at Tolcarne at present. We put it to work yesterday. That level is in about 17 fathoms from the shaft.

9656. How close are the pipes taken up to the end of the level?—About three fathoms behind. We generally keep a false pipe, and when they blast a hole they take out that pipe and put it back again afterwards.

9657. How long is the powder smoke before it clears away where this pipe is?—Probably ten minutes or a quarter of an hour.

(C. *k.*) *Water Blast.*

9658. How long would it be if the pipe had not been put in?—Probably half an hour or more. I should say more than that.

Capt. John Michell.

10,063. (*Chairman.*) Is it close at all there?—It is a little close, but we have a waterfall throwing in air to the men.

10,064. Is it one of the usual waterfalls?—Yes, the waterfalls about ten fathoms.

10,065. How long is the smoke getting away there?—It is not very hard ground, perhaps they fire a hole once in eight hours, or something like that, but the smoke does not stay more than about a quarter of an hour, or twenty minutes. We have put pipes in.

10,066. Before you put the pipes in, the smoke did hang there?—Yes we put them in of course for our own advantage as well as the men's, for we find that by putting in air pipes we get our men to work an hour or so longer in the eight hours. There is no doubt about that. I suppose that in ground of 4*l.* or 5*l.* a fathom it will make 10*s.* or 15*s.* a fathom difference whether we give them good air or not.

Mr. John Bryant Wilkin.

11,628. (*Chairman.*) When the air gets very close, what machines do you put in?—I generally use a waterfall if I can get it.

11,629 Is that the best contrivance do you think?—Yes, I think so. We are turning down the water at our mine at two different shafts to blow the air into the ends from the ends surface. The water cools it as well, and it is about as cheap a method as any; we let the water fall down a pipe in the shaft, and the bottom end of the pipe goes into a cistern, and then there is another pipe from that which is obliquely taken into the end.

11,630. How do you couple on the pipes?—We stick on a false pipe on the side of the other, and take the air out of the false one.

11,631. I suppose the end of the pipe is made to take on and off on account of the blasting?—No; we bring it in within a few fathoms; it answers the purpose. Not close up.

11,632. After you have put in a pipe, in how much shorter time is the powder smoke cleared out of a level?—I think it would got out in about half the the time; if a pipe is well in, it will get out in a quarter of an hour; the closer the pipe is in the better.

11,633. You cannot take it quite close in, on account of the blasting?—No.

11,634. Have you ever tested the quantity of water or the quantity of air that you have sent down in that way?—No; we measure it by putting a candle against the pipe, and if it blows it out, or nearly so, we consider that a good test

11,635. (*Mr. Holland.*) How much water does it consume?—It is just a small stream; two gallons a minute I should think would give a good circulation of air.

(C. *l.*) *Wooden Sollars.*

(*l.*)—WOODEN SOLLARS.

Mr. James Seccombe.

1386. (*Chairman.*) Would not wooden pipes answer as well as zinc pipes?—I do not think wooden pipes would do; I think that they deaden the air a little sometimes, for a long distance.

Mr. Francis Barratt.

4447. (*Chairman.*) What means of ventilation did you adopt when you were driving away from the shaft?—A brattice.

4448. From the shaft?—Yes.

4449. Is that carried along the level?—Yes.

4450. Is that made of wood?—It is a sollar, as we term it.

4451. Is it necessary when you have a sollar to raise the height of the level?—Yes.

4452. With a sollar to what height do you drive the levels?—Eight feet, six, or nine feet.

4453. Leaving for the sollars about two feet?—Fully that.

4454. And that is carried on to the full extent to which the men are working?—Yes; within about two fathoms.

4455. Do not those sollars wear out very quickly?—There is a rail laid on them.

(C.)—VENTILATION.

Wooden
rs.

4456. You do not use any barrows on them?—Very rarely.

4457. With a rail upon them those sollars will last?—Yes.

4458. Is the air passing through them at all affected by passing through the wood?—We do not observe that.

4459. Does the wood soon get rotted through?—No.

4460. What kind of wood do you use?—Deal.

4461. I suppose that where you are working now is not a wet mine?—No; it is dry.

4462. Do you consider that the ventilation by that means is complete to the extremity of the end?—Yes; the current is either under the sollar or over, because we have doors in the levels and at the shafts so as to change as the draught changes.

4463. Do you mean that the draught is affected by the weather?—Yes, by the wind.

4464. How many shafts have you?—Six.

4465. If the ventilation is much affected by the wind you then shut the door down in order to force the air down the sollar?—Yes, either to drive the current over the sollar or under it.

4466. Is your object to introduce fresh air by the sollar?—Yes. That is constantly going in over the sollar or under the sollar.

4467. In that change of the current of air is it changed from under to over, or from over to under?—It is according to the wind.

4468. That is from the communication that the sollar has with the shaft?—Yes.

4475. How soon is the smoke cleared away from the end to which these sollars are conducted?—That will depend upon the strength of current; sometimes perhaps it may take three or four minutes, and at other times it may take three times that length of time.

4476. What should you say would be the longest time before it could be cleared away?—I think that an end would be clear of smoke in about 15 or 20 minutes.

4477. Is the current also affected by the temperature?—Yes.

4478. On a close heavy day I suppose there is not much circulation?—No.

4524. (*Mr. Davey.*) Then you did not at a distance of 200 fathoms from the shaft drive the air all the way in there?—Yes, we did; it was a cross cut south.

4525. And you carried out the whole of the 200 fathoms by the use of the sollar?—Yes.

4526. Did you find that at all times sufficient to drive the air in?—Yes, quite sufficient, unless it was a very foggy day, and then the mine was generally affected.

4598. (*Mr. A. Bruce.*) Does this system of ventilating by means of sollars apply to rises as well as to close ends?—Yes.

4599. Do you so apply it?—Yes.

4600. Then the men working in low rises are just as well off as if they were working in any other part of the mine?—Yes; they are tolerably well off.

4601. Why are they not perfectly well off?—In the rises the stuff may fall down and may choke the passage, and therefore the air is obstructed for a short time.

Capt. John Webb.

5428. (*Mr. Kendall.*) In any of the mines that you have visited do they use air sollars?—Yes; that is frequently done.

5429. Does it answer?—Yes, when you can get a strong current and a trapdoor, as we call it, to throw it into that sollar instead of above.

5430. You think that that is a good mode of ventilation when you can apply it?—Yes; but we cannot always apply it. We must have a strong current of air to apply it; because if you confine the air under a sollar it will be contracted, and it will not travel so easily unless there is a strong pressure.

Capt. Richard H. Williams.

6329. (*Chairman.*) I presume that you can draw air to the jet at as great a distance as you can throw the air?—Yes. For a very long time in Cornwall we have used wooden air pipes, and men in putting them in sometimes give them a blow too much, and they open the sides a little, consequently they have been so imperfect that I have found that in drawing air with the wooden pipes, we have been taking in air all through the level, so that we have had a very strong blast at the end of the air pipe, but it has sent an impure air to the men at work. But if the pipes are tight, as we are now making them with galvanized iron, there is not the least difficulty.

Mr. John Nankervis.

(C. 1) Wooden Sollars.

7223. (*Chairman.*) Have you resorted to the means you have spoken of?—Yes, when it is so warm, the men sweat so much that they cannot exert themselves as usual, and then we assist them with an air machine, which has a wooden board at the bottom, and is like a conduit pipe, and they can take the air from the winze; at other times we take the back away, and put in stools.

7224. Which do you think is the best mode of supplying air?—That depends upon circumstances, if the ground is such as to be able to take it away over head, it answers two purposes, putting stools to work on and to ventilate too; otherwise we put it in the bottom, and that is a less expense.

7225. Is there any water there?—There is very little, generally speaking, in our mines.

7226. If it is put on the bottom is it not more likely to be stopped up?—It requires attention to clear it out when it is put in the bottom; it is covered over, to prevent the stuff getting into it.

7227. Is it looked to every day?—Yes it is, generally.

7228. Does the captain of the mine examine it every day?—He may not be there every day, but when he comes and goes he sees that everything is all right.

7229. How does he try it?—By putting down a candle there.

7230. In order to see whether the air is coming through?—Yes; he can put his head down.

7231. If he found that the air was not coming, he would think that there was something wrong?—Yes.

7332. Do you think that that plan is as good as the hand machine?—It is cheaper, as the hand machine requires somebody to work it; there must be manual labour connected with that—a boy.

7233. It takes three boys in the course of 24 hours?—Yes, we work about six hours, when we set the work on piece work; a tribute man can work seven or eight or nine hours if he chooses.

Capt. William Stevens.

8146. (*Chairman*). Do you ever put in air sollars?—Yes.

8147. Which do you prefer, an air sollar or a machine worked by hand? I prefer an air sollar, but there is not every place convenient to put in an air sollar.

8148. Do you put your air sollar at the top of a level or below?—At the bottom.

8149. How long is the smoke in clearing away in your closest ends?—Perhaps an hour and a half.

8150. Do the men go in before that?—The men, if they do blast their holes, do it when their core is up.

Mr. John Nancarrow.

8479. (*Chairman.*) Have you no artificial means of ventilation?—No, we do not require any; we only just put a sollar into the bottom of a level.

8480. You do that?—Yes.

8481. Have you any levels in which a soller has been placed?—Yes, one.

8482. Is the air not quite so good in that level?—It is warm.

8483. Which level is that?—The 170.

8485. How long does the smoke hang about in the level in which the sollar has been placed?—It might stay for an hour or two. We only work it by two cores out of four. We have one idle between, so that it is completely cleared out before the other comes.

8486. What is your object in doing that?—In order that the men may be able to work it better.

8487. You think that if a fresh core went down to relieve the other, the state of the air in the level would not be so good as if it were dealt with as you have described?—Certainly not.

8488. Therefore in order that the air may become improved by the men being out of the level you leave it for a short time to be ventilated?—Yes; in fact it is completely cleared out.

Capt. Charles Thomas.

8706. Have you ever tried a sollar in any of your mines?—Yes; formerly we did that more than we do now. We do not drive in any mines that I am connected with very long levels without making a communication. We never do that now.

8708. In your opinion is a sollar a sufficient mode of ventilating a level?—It is very useful when you have

(C.)—VENTILATION.

(C. l.) Wooden Sollars.

a strong draught coming through the level, putting in a sollar there, and then throwing all the air under the sollar.

8709. (*Chairman.*) May not a sollar be in a level without supplying sufficient air to the end?—Yes; it depends upon the quantity of air that you have passing through the level. You can, of course, only take up the quantity that is coming through the level; if there is but a slight draught coming along it would not be very efficient to force it into a long level; sometimes we have a very strong current, and then to take hold of that, the air then that will go in under the sollar is very effective.

Mr. John Richards.

9457. (*Chairman.*) Have you no means of forcing it into the end of level?—Yes, we have; we put in air sollers where we have a draught outwards, and keep it up from the bottom as high as this table, and the air rushes in.

(C. l.) Wooden Sollars.

9458. Have you got that now in the 120 fathom level, or in the 230 level?—No; we do not want it there.

(*m.*)—METAL PIPES.

(C. m.) Metal Pipes.

Mr. James Seccombe.

1381. (*Chairman.*) Iron pipes would be expensive, would they not?—I have used 100 fathoms in Marke Valley, for after putting in zinc I found that where the water came it soon knocked holes into the pipes, and I found that the iron pipes were cheaper.

Mr. Peter Clymo.

2314 (*Mr. Kendall.*) Prior to putting in the air pumps the air of course gets a little dead, and then you remedy it?—Yes, we then put in a machine directly for drawing the air, and where we have long distances we have at different times ordered zinc pipes on purpose, because a wooden pipe will destroy the air a good deal more than zinc. The zinc pipes convey a great deal better air than the wooden pipes would.

(D.)—SUPERINTENDENCE OF MINES.

Capt. Charles Thomas.

(D.) Superintendence of Mines.

8726. (*Chairman.*) Is it not the business of any one in particular to report upon those matters specially?—It is the business of the timber-men to go at once and repair anything that is faulty without asking for liberty; that is part of their duty. When they find a stave gone out of a ladder or a board gone out of a platform, it is their duty at once to go and mend it without naming it at all.

8727. Is there no one to report to you that all that is properly done?—No; we see it ourselves, as we go through the mines. It ought to be, perhaps, in connexion with this matter, stated that the captains go through every part of the mine, and if they see anything out of order they would call upon the man in charge, and order him at once to put in a stave or put in a board that was wanting.

8728. How many sub-agents or captains underground have you at Dolcoath?—There are two who are called underground agents; my son is assistant to me as manages.

8731. With the agency that you have employed in these mines how frequently are the underground workings inspected?—Some of the scattered pitches perhaps only once a week. All the principal parts of the mine are inspected twice a week, but a couple of men may take a pitch in some distant part of the mine and if that is seen once a fortnight that is as much as we think necessary.

(D.) Superintendence of Mines.

8732 How often are the tutwork bargains looked to?—Three times a week we consider sufficient for our hard-ground mines. In soft ground we should see them oftener, but in hard ground the change that would be effected by a pair of men working for two days is just nothing.

8733 Do your underground captains go underground at night?—Very seldom indeed; not in deep mines, excepting in cases of an extraordinary nature.

8734. So that you trust to the men who are at work—the tutwork men, the tributors, and the timber-men—to comply with the rules laid down for their observance?—Yes.

8735. Is all the work let on contract?—Yes, all in Dolcoath mine, for one month or for two months. I should say that we never set a single bargain; in the course of a month we set out all the stopes in the mine at so much per ton for what is fit to stamp when it is brought to the surface; they are a kind of tributors, and they depend quite upon their own resources; if they break down deads instead of tin they get nothing for it; they are confined to breaking tin stuff that will pay for stamping when it is brought to the surface.

(E.)—ACCIDENTS.

(E.) Accidents.

Mr. Andrew Kingston.

3270. (*Chairman.*) Are there any other sort of accidents which have come under your notice?—Fractures; a few accidents from machinery. I have had two accidents where youths have been caught between the rollers that grind up the ore, and they have each lost a leg.

3271. Is there any protection?—There cannot be any protection there. They have slipped back, having forgotten it; you cannot cover up the opening, but while the thing was at work they appear to have forgotten it; they suddenly stepped back and put their leg between.

3272. Could there be no protection?—No; nothing could prevent that.

3273. About what age were they?—Fifteen or sixteen.

3274. Was this exposed to the weather?—No; under cover.

Mr. W. W. Tayler.

3968. (*Chairman.*) Have you had any accident arising from the man engine?—Never.

3969. Have you had any cases during the last few years from accidents of any sort?—Yes; we have had several; we are always having accidents,

3970. What do they arise from?—From blasting underground.

3971. From any other cause?—Sometimes by ground giving way and crushing a man at once.

Capt. Thomas Richards.

8944. (*Chairman.*) Has any boiler explosion taken place during the last five years?—Yes in Wheal Kitty.

(E.) Accidents.

8945. Did you ascertain the cause of the accident there?—There was no means of ascertaining it. We had only our own ideas upon that point.

8946. Was a man killed on that occasion?—No.

8947. What is your idea as to the cause of that accident?—The engine had been idle from morning till night. There was rather a longer stop than usual, owing to their having different repairs to do, and on the Saturday the engine went to work at about eight o'clock, and they had not worked many strokes before the boiler blew up.

8948. (*Mr. Holland.*) What part of it?—Every part of it; it went down as flat as could be, and through things 600 feet off. It was rent like so many ribands.

George Smith, Esq., LL.D.

10,241. (*Chairman.*) I see that a great many accidents occur in mines; have you ever turned your attention to what are the causes of those accidents independently of blasting?—The accidents which usually occur, and which come under my notice, are of a kind to indicate the means of prevention themselves: men falling away from the ladders. Some accidents occur which I suppose no human foresight could deal with at all, such as the falling of stones and loose ground. I have known several men in the last year or two injured, and one killed by that means.

Capt. John Prout Daw.

11,487. (*Chairman.*) From a return which I have I see that several accidents happen in the mines, and that a great many persons are killed by a fall from one level

(E.)—ACCIDENTS.

(E.) Accidents. to another; how does this happen?—Sometimes through carelessness.

11,488. Where does a man fall; is it in the shaft?—In the shaft and sometimes in winzes sunk from one level to another. You may have ever so good a footway but you will sometimes find that men, and especially young men, race, and they will sometimes throw away one of the others, and sometimes they will take up too great loads and carry them from one level to the other, which they ought not to do. Our men have no reason to carry down anything; our skips are open to carrying anything which they require. Sometimes men fall from one level to another through winzes and where there are very good ladder-ways.

11,489. There is no protection put at the mouth of the winze?—We cannot put any protection at the mouth of the winze.

11,490. If a candle went out and a man had no means of lighting it, how would he get up from a low level?—They have now generally matches.

11,491. But suppose that the matches got wet?—If they were not well acquainted with the road their better way would be to stop where they were till some person came along; some person generally comes along every hour or so.

11,492. They would not be safe without a light?—No.

11,493. (*Mr. Holland.*) Do you not sometimes go along the levels without a light?—You may do so; but sometimes there are sinks, and you get deceived by going in the dark.

11,494. I saw a man going along a level on his hands and knees without a light; is that a common thing?—No.

11,495. (*Chairman.*) I suppose that a man would sooner go on his hands and knees than stay two hours?—He would.

11,496. (*Mr. Holland.*) You said that there were no means of protecting the winzes which were left open; could not a grating be put over them without interrupting the ventilation?—I think not. I think that that would injure the ventilation.

11,497. It would stop the ventilation very little; they are in coal pits?—Our drivages and sinkages are rather small compared with what they are in coal pits.

11,498. A coal pit has a much greater current of air than you have?—Then the gases are much stronger.

11,499. Is there any objection except the expense?—The expense of it would be a mere trifle, because we could generally sollar over a place which would take a man through.

11,500. I do not mean sollaring, but I mean that a grating or a fence might be put round?—When you go down a mine generally that winze is sollared over more than where the ladder is to take a man through. The expense of a few boards on the edge there would be nothing, so that it cannot be on account of the expense.

11,501. (*Mr. Kendall.*) In many places where the winzes are you ascend and descend by ladders, you could not put gratings over those without the trouble of removing them every time?—No, you could not.

11,502. Is there any danger with ordinary care?—No.

11,503. Might not a man go ten thousand times without any accident if he was moderately careful?—Yes.

11,504. You often put a plank a few inches wide, and the men would fall if they slipped; but is there no danger of their falling?—No.

11,505. If the light goes out they should wait till they get another light?—Yes.

11,506. And if they run any risk it is their own fault, they should not do it?—Just so.

11,507. But with ordinary and common care the winzes and shafts are not dangerous?—Not with ordinary and common care.

11,508. Have you ever known an accident of that kind happen underground where common care was used?—I do not know that I have. Where accidents have happened, some I have seen have been through carelessness, and I have heard other men say that if they had used a little more care it would not have happened.

11,509. (*Mr. Holland.*) Did you ever know an accident either above ground or below except from carelessness?—I do not know that ever I did.

11,510. (*Chairman.*) Besides winzes, when you find a bunch of ore do you not drive down?—Yes. If we find a bunch of ore we drive on the level, and sink down after that. There are many sinks made by the tributers in stopeing away the ground, which would be equally dangerous with the winzes, and more so. (E.) Accidents.

(a.)—ABANDONED SHAFTS.

Capt. J. P. Daw.

11,511. In an old mine there are many footways and shafts which are abandoned, are there not?—Yes. (E. a.) Abandoned Shafts.

11,512. Are those always protected?—We look after that very closely.

11,513. Do you think that that is generally done?—I am sorry to say that it is not. I could point out many instances where it is not done.

11,514. And that of course causes great danger?—Yes.

George Smith Esq. LL.D.

10,246. (*Chairman.*) Are there any accidents from falling down an abandoned shaft, from its being left open at the top and not protected?—I think that I have not known but one such case for many years.

10,247. Is it within your knowledge that there are many abandoned shafts which remain open and unprotected?—Not many. You find one here and there, but I do not think they are numerous.

10,248. Is there any law compelling the abandoned shafts to be protected?—I am not aware that there is. I have never known a case in which a representation made to the proprietors of the mine or the mine agents has not been attended to.

10,249. All such cases, I suppose, would come before a coroner's inquest?—Yes.

(b.)—BLASTING.

Mr. William Richards.

1056. (*Chairman.*) Have you had any accidents occur from blasting?—We have only had one during the 12 years. (E. b.) Blasting.

1057. How did it occur?—It was through the carelessness of the man, it was a premature explosion.

1058. Was it from his going back too soon?—It was from the carelessness of inserting into the awl the tamping before he had properly cleaned out the awl, and taken out the few grains of powder on the side of the awl; what we call the swabstick.

Mr. Thomas Trevelyan.

1146. (*Chairman.*) You have never had any accident from men being careless in blasting?—Never.

1147. Have you certain rules laid down for them?—We have rules, and I take upon myself at all times to give them advice to be cautious, and mind what they are using, and we have been very fortunate, and have never had an accident in blasting.

1148. But do you think that unless the men are properly advised and looked after they become careless in blasting?—They are tolerably considerate and thoughtful men, they know what powder does, and knowing the results of powder, they know that they are dealing with a very important ingredient.

Mr. Peter Clymo.

2262. (*Chairman.*) Have your men any set of rules given them with regard to blasting, and their conduct down in the mine?—No particular rule. It is all done with the safety fuse; it used to be done with a large nail, but that is hardly ever used now.

2263. Then any accident happening from blasting must be the fault of the men?—I believe that a good deal of it is that.

2264. But there is a certain danger nevertheless in blasting?—There must be some, particularly if the men are not very careful in what they put into the hole for tamping; they should be very careful in selecting the stuff for tamping, that is in filling up the hole upon the charge. But I am sorry to say that many of them are not sufficiently particular in that respect, the men take anything for that purpose, being in a hurry to get their work done; but that is a very important thing, and they ought to be very careful about it, they are frequently cautioned about being very particular in that respect.

(E. b.) *Blasting.*

Mr. Andrew Kingston.

3262. (*Chairman.*) Have you many cases of accidents in mines brought under your notice?—We have in the course of the year. We have had rather a large number of gunpowder accidents lately in my district. I have had three within the last three months.

3263. What sort of accident is that?—The holes going off prematurely.

3264. What has been the effect?—Two of the men have lost both eyes, and one has lost one eye; and one accident, which occurred only this last week, was a very trivial accident, the man had a few marks over his face, and his hand was burnt. They almost always burn the hand.

3265. In those cases have you asked the men how the accident occurred?—Yes, I generally do; and it is generally in what they call the picking out the holes. The last accident was in tamping; it occurred as soon as he began to tamp. I said, "Had you nothing soft?" He said, "There was nothing soft there." So that he tamped with a hard material, and the powder exploded immediately; but the powder only just being in, he was not injured much, the burden of the hole was not thrown.

Mr. John Pearce.

4003. (*Mr. Austin Bruce.*) How long ago was that?—About 20 years since; but many of the men lived there, and I suppose some even live now who have this miners' consumption; we can see it for years before it takes such a hold of a man as to incapacitate him for working. A man may continue to work, although the disease has already begun to form in him. I noticed that they were all old men in Beam mine at the age of 40, but I should not call all our miners old at 40. In Beam mine it was the case, they looked like old men; in fact, in riding through the district, if you saw them, you would say "that is a Beam man!" I have also made this memorandum, that the men very often rush into hot-air ends after blasting a hole with powder, they rush in too soon. I have been told that they are anxious to see the result of the blasting, and that hot air has immediately produced coughing; and this disease, which is called miners' consumption, although it is not tubercular consumption, is just as certain in its results; it has all the general symptoms of phthisis, and is as certainly fatal in its termination as is consumption. I can compare Bucklers Charleston mine with Beam. It is an unusual thing to find miners' consumption formed in Bucklers Charleston mines; it is not very deep, and it is very well ventilated. I speak of the former working. I do not attend there now, and all the mortality among the Charleston miners I consider is produced in the first place by accidents which are unavoidable in many instances; and one of the greatest sources of injury to the miners is their blasting with open powder, putting it into the holes in that state instead of in cases: that is a frequent source of accident.

4004. (*Chairman.*) What do you mean by the word "open"?—The miners will bore a hole and put the powder into that hole without putting it into a case, and I think that no case of an accident from blasting has occurred where a proper tube has been used, and the powder has been put into the tube to be put into the hole; it is for this reason that the men in putting in their powder very often leave grains of the powder adhering round the hole and round the mouth of it; whereas, if it were put in in a case the powder would not be loose, and there would not be the same chance of fire getting to it as there is when it is put in in a naked state. I think also that it is not so liable to explode in the tamping, and another cause of accidental explosions is this,—as I have often said to a miner, "You have been using the mallet again!"—instead of holding the bar in one hand and beating it with the hammer himself, when he would feel what resisting power there was; one of the miners will hold the bar, and another miner take the hammer, and beat it with two hands as if they were boring. That is prohibited by the agents, but the miners frequently do it.

4087. (*Chairman.*) Are there any men who have met with accidents under your care?—Yes, several.

4088. What number of cases have you on your hands now?—I am now attending four men who have been injured by blasting.

4089. How were they injured?—By the sudden explosion of the powder in the hole. (E. b.) *Blasting.*

4090. What is the nature of the injuries they have sustained?—They are generally about the face.

4091. Do the men sometimes lose their eyesight?—Very frequently.

4092. Will you be good enough to state how the accidents to which you have just referred have occurred?—They occurred in tamping. There was one case in which a man was looking into a hole on the naked powder. I do not know for what cause, but they often come to the hole before they put in their tamping and look down, and I have a notion that if there is a fraction of powder present, or, in fact, any powder containing sulphur, that free sulphur is thrown out, and that may be the means of carrying fire down to the naked powder. Hence, I have strongly suggested that the powder should be put in cases, and put into the holes in that way. In two of the other cases the accidents resulted from putting in what they call their first laying of tamping, and there they were using mallets, that is, one man was holding the bar, and another was beating it in. In the third case the accident also arose from putting in the tamping on the powder.

4093. In the latter cases the accidents arose from the men's own fault?—Two of them did, but in the other two cases it did not appear to be so, as the men were tamping in the ordinary way.

4094. Were these the first and only cases that have been brought under your notice?—No; I have had, I dare say, 40 or more cases; and I remember some time back, where the Charleston mines were being worked the last time, that they used to shut the cracks, and put in a very large quantity of powder, and most fearful accidents resulted from that practice. It could not be from tamping, but the men would look over their cracks with a candle, and the powder would go off, I cannot say how, but I have there seen it; I recollect one case in which a man was brought up in a bag, he had been blown literally to pieces, his arms in one place, and his legs in another. But such fearful accidents do not occur where there is simple shooting in the ordinary way.

4095. Are there not strict rules and regulations laid down for the observance of the men?—The men are forbidden to go in after a hole has missed fire; they are forbidden to go in again during that spell, and they are told that if any accident occurs from their using a mallet, as I have just spoken of, they shall have no benefit from the club, but still they do it.

Mr. Francis Puckie.

5012. (*Chairman.*) What other accidents have happened in your mine?—The greatest number of accidents that we have had, have arisen from powder explosions.

5013. Do the men put the powder into the holes in cases?—Some do and some do not.

5014. Is it left to the judgment of the men alone?—Yes.

5015. Do you supply cases for the purpose?—Yes, if the men choose to use them.

5016. Are they charged for?—Yes.

5017. What is charged for them?—I think it is something like 1½*d.* each.

5018. Do you think that prevents them from using them?—I have no doubt it does in some measure; then others again do not like them, they would rather shoot with the raw powder; they consider that the cases take up too much room, and they would rather have the powder contained in the hole without anything.

5019. According to the size of the hole they think they can get more powder in?—Yes; or that they can regulate the charges as they calculate upon the burden of the ore.

5020. So that in order to get the same explosive force from the powder, they must make the hole somewhat larger?—Yes; the bag may be a little too large and sometimes a little too small for a hole, and many of our men instead of using the prepared cases will make bags themselves for the powder; they would even rather have them that way than have those prepared cases, as they do not come so expensive as the others.

5021. How do the accidents generally happen?—They happen in the tamping, that is, after the powder is put into the hole it is filled up with the small stuff, killas generally; we never calculate to put spar for tamping; for it is very fiery and very sharp, and apt to cut the fuze; we generally tamp with killas

(E.)—ACCIDENTS.

Blast-

5022. Suppose the men are working, are they supplied with anything to put in?—No, they go back and choose their own material for tamping,

5023. If they take the wrong material it is attended with more danger?—Yes.

5024. How does an accident happen from tamping?—It is generally from the first portion which they put in on the powder that is generally the worst time for an explosion; some of them are not careful enough, and at other times these explosions occur through the men's neglect after they have got the powder in a hole; a very careful man almost always puts in dry sludge, which is as fine as flour; they will put it in upon the powder, and will ram it in with a pud, then they will take the end of this pud and put it in the water-pipe, and hole out all the powder from the hole, and in doing that there is scarcely any danger, but often again they are careless, and they will even put the powder in the hole and ram it down with an iron bar, and then perhaps, after they have put in the powder, and they come to put in their first portion, they are not careful in cleaning out the hole. They will ram away, and perhaps make fire in the hole which will ignite the powder; that is the only way in which we can account for those explosions.

5025. Do your men use steel borers?—Yes.

5026. Do they use them to ram down with?—We never use them for ramming; we use a steel borer to bore a hole.

5027. Did you not say that the men used a borer and rammed with it?—No; that is the tamping bar.

5028. Is that made of wood?—No, the tamping bar is of iron, but we have always a swabstick to clean out the hole with.

5029. Do you think that accidents occur from not cleaning out the hole?—Yes.

5030. And not putting in the proper material?—Yes; perhaps too fiery a material for the tamping

5031. In ramming it down a spark may be made?—Yes; it is just the same as rubbing a piece of iron over spar stone, you will see fire follow from it.

5032. In ramming it down, why should not the stuff be put together?—It would not tamp tight enough, it has to be rammed as tight as the rock itself.

5033. Is there any material that they could use for tamping that would not strike fire?—I do not know, we always tamp with iron

5034. Have you ever heard of a composition of metal that would not strike fire?—We have never had it nor used it.

5188. (*Mr. Holland.*) With regard to blasting, you told us that accidents happen in blasting from filling in the hole with killas, which sometimes strikes fire by tamping it in?—Perhaps it is for the want of putting killas in. They may put in perhaps a hard substance; they may put in spar, and not the proper material.

5189. Do they habitually put in some soft substance such as paper or hay?—They generally put in something soft upon the powder; they take up some fine stuff from the bottom of the level, and put it upon the powder.

5190. Do they habitually put in soft stuff, such as paper, or hemp, or tow?—Not as a general rule; sometimes they put in dry clay.

5191. That is very good if you have it, but suppose that you have not it?—Then they will take up some fine stuff from the bottom of the level as fine as flour. A wooden rammer would not do in all cases.

5192. (*Mr. St. Aubyn.*) Would a copper one do?—Yes, it might do better, because it would not strike fire.

5193. (*Mr. Austin Bruce.*) If a wooden rammer would not do at all times, an iron rammer would be necessary sometimes?—Yes, of course.

5194. Can an iron rammer be used without a certain amount of risk?—There is a difference in the nature of the ground; some ground requires harder tamping than others. A good deal depends upon the difference in the hardness of the ground.

5195. (*Mr. Holland.*) But is it not a proper thing to use that which is always safe?—Of course it is.

5196. Why not use a copper rod?—The only thing is that it is more expensive; but I do not think that we ought to find fault with that in a copper mine.

5197. How much more expensive is it?—I suppose as four to one,

5198. How long will it last?—I suppose iron would last longer than copper.

(E. b.) Blasting.

5209. (*Mr. Kendall.*) With regard to tamping, your instructions always are to put something in very soft on the powder?—Yes.

5210. And, among other things, you recommend the fine stuff which comes out of the boring?—Yes.

5211. It is the finest dust?—Yes, as fine as flour.

5212. If you struck the iron as hard as you could against that dust a thousand times you could not create a spark?—I do not think you could.

5213. You put in that first?—Yes, we always order so; but I believe that sometimes it is seriously neglected.

5214. And your belief is that when an explosion takes place it arises from the miners not following out the orders given them by the agents?—I should say so.

Capt JOHN WEBB.

5393. (*Chairman.*) With respect to blasting, how do your men fill the hole; do they put the powder in cases or not?—The general system of blasting in the county is to put the naked powder into the rock; but some captains say that the men shall use a case of paper or some other kind. That is the only safe way.

5394. You recommend a case?—By all means.

5395. Does not the hole require to be bored larger when there is a case?—No.

5396. The case must take up so much of the hole; so much less powder can be put into the hole?—You can put it firmer, more solid, and closer into a case than into the hole, unless it is driven in by a bar or something of that kind, which some men will do wilfully, and blast themselves by it.

5397. Will the hole contain the same quantity of powder if it is in a case as if it is not in a case?—I have tried it, and it will contain more, because you can put it in firmer. I have a case in my pocket. I have been studying that matter for years, and I now make all my men use cases.

5398. What do you charge them for those cases?—The price varies. (*The witness produced a case.*) It is prepared waterproof cloth.

5399. What is the cost of a case to the men?—That size would be about 12*s.* per hundred; in fact it is my patent. I took out a patent some time ago for it, and a great many of them are used in the county. There is a wadding of cow-hair as a protection for the case and a foundation for the tamping.

5400. That prevents the danger?—That prevents the danger; there never is any. You never find an accident if the men will use those cases. I make some cheaper ones than that for dry ground.

5401. Those are for wet ground?—Those are perfectly waterproof.

5402. Do you think that the reason against the men using them is the price?—Some have objected to the price, but I contend that it is cheaper, because less powder will do; it will keep thoroughly dry, and if the powder is put into a rock where it is damp, without a case, it will destroy more powder than the case will cost, and damp powder will make a considerable deal more smoke.

5403. So that you would recommend the cases to be used for the safety of the men?—Those, or some cases; I prefer those, but they are my patent.

5404. For the safety of the men, you think that powder should always be put into a case?—Yes. The hole should never be blasted unless there was a case for it. I have known scores of accidents in my day from the want of it.

Capt. RICHARD H. WILLIAMS.

6347. (*Chairman.*) I believe that your men in blasting always use cartridges?—Yes.

6348. They make them themselves down below?—Yes.

6349. Have you ever had an accident from blasting? We have had no serious accident since the mine has been at work.

6350. Will you describe what was very nearly being an accident the other day?—A pair of men had an upper hole; that is to say, bored up in the back of the level, and the hole was very ragged, and they put their bag up, and put up three plugs of tamping. There was one man holding the bar, and the other was driving it up, and they saw the fire come out of the hole, and they just

(E. b.) *Blasting.*

fell back, and it went off bringing part of its burthen; that was by cutting the fuze—the ragged hole cut the fuse.

6351. In your opinion, would not that have been avoided if they had used either a copper or a bronze tamping rod?—Perhaps it would.

6352. Would it be desirable to have a tamping rod which would not create a spark by striking against the side?—Yes.

6353. (*Mr. Holland.*) Would that be a heavy expense?—It would be very expensive in large mines. I have thought of a plan of having a copper tube the size of a tamping bar, and putting an iron bar in it so as to have an outer casing for the bar. I sent some iron to Birmingham, and had it galvanized, and tried some experiments with it, but I found that that galvanizing very soon rubs off. By the other plan we should have the stiffness of the iron bar to beat with, and we should have the copper tube.

6354. (*Mr. Kendall.*) Have you any idea what the extra cost would be if you had the tamping iron cased in the way that you have suggested?—I should say that one bar in that way would cost ten of the others.

6355. Even in this modified form?—Yes.

6356. What is the cost of the present tamping iron?—About 4*d*.

6357. Then I suppose that a copper one would be about 3*s*. 6*d*.—I should think that it would.

6358. How long would that last?—I suppose that the copper would wear faster than the iron.

6359. But how long do you think that that might last?—I should think that it would last six months; a large portion of the copper would be still to be re-sold. This is only just an idea which has suggested itself to me, and I have been trying some experiments in the way of tamping bars lately. I think that a proportional length of the tamping bar might be made so as to have the full size of the iron up about 3 inches from the flooring; that is the flooring to be 3 inches long, and to have the bar from the top of the flooring upwards its usual size. When the bar becomes short it is of no use, and is thrown away.

6360. Taking it in the most expensive form it would not cost much more than 7*s*. a year, in order to insure against striking fire?—I should not think that it would.

Mr. Richard Quiller Couch.

6472. (*Mr. Kendall.*) Have you any suggestions to make to the Commission with a view to improving the ventilation in the mines?—There are many suggestions to be made. Some of the miners are injured by accidents, for instance, by explosions; and I have tried to invent something in order to remove the tamping from the holes, but they object to use anything new, and will not even use what has been proved to be good; the captains have often to complain.

6473. What is it that you would substitute?—Instead of taking the tamping out in the usual way, I would use a thing something like a corkscrew, to be worked in the same way that a carpenter works an auger, to go down to the bottom, and then drawing it out almost like a cork from a bottle; you may not take all of it out, but it would be so loose that water could be thrown in on it and so prevent explosions.

Captain Richard Boyns.

6750. (*Chairman.*) Are the tamping rods of iron?—Iron, with a composition of brass, copper, and some mixed metal, but lately we have introduced oak sticks. We cannot get the men to do as we wish. When the agents turn their backs, the men will very often charge their hole with the borer; they are very reckless in this respect.

6751. These tamping rods are of composition?—Yes, a piece about two or three inches long, put on at the bottom of an iron bar.

6752. (*Mr. Holland.*) Is it bronze?—Yes.

6753. (*Chairman.*) And it is such that if struck against the rock it will not create a spark?—I have heard some of the miners say that they have seen fire when they have been using them.

6754. The object, of course, in furnishing them with these rods is to prevent a spark being created and igniting the powder?—That is the object.

6755. But you are not quite sure that the composition which you use has had that effect fully?—I believe it has. I have heard some of the miners say that they have seen fire in the hole. Some of our miners would strike fire with almost anything. We have engaged to supply them free of cost with oak sticks, which is the hardest wood, and the greatest portion of them at this time are supplied, on purpose to prevent accidents.

(E. b.) *Blasting.*

6756. Is the oak stick considered by a miner heavy enough for that work?—That is a question upon which they differ very much. I can come to no decision at all upon it in my own mind. I have heard some of our best miners say that they can sufficiently tamp the powder with oak to blast the rock in this district, and that powder does not require so much tamping as some of our miners imagine, and I believe that that is a very prevalent notion.

6757. But there is an impression that they cannot tamp sufficiently with an oak stick?—That impression exists, but I am inclined to think that the powder can be tamped sufficiently with it.

6758. At all events an oak stick is another tool that they have to carry?—Yes, they would have to carry it down; it would be very little trouble to them to do that.

6759. Would an oak stick be substituted by you for the other tamping rod?—No.

6760. (*Mr. Kendall.*) They would take both?—Yes; the tamping should be put it on the powder with something stronger than an oak stick, I think.

6761. (*Chairman.*) Therefore you would consider the oak stick extra to the present tamping rod?—Yes.

6762. (*Mr. Holland.*) Is the oak stick used for pushing the powder down, and the tamping rod for driving the tamping?—Yes.

6763. (*Chairman.*) Has the safety fuse been introduced in your time or was it before your time?—Since my time; I cannot say how long.

6764. That has been of great use in preventing accidents?—Very great. There is no question about that.

6765. Have you had any accidents from blasting in your mine in the last five years?—We had an accident not more than two months since, but it was not a serious one; the man has recovered nicely. The rock was blasted to the bottom of the hole, I believe. The man has gone to work again. We have had accidents in our mine, but not many, considering we have been working a long time. From 1834 up to this time, only three men have lost their sight.

6766. Was that what induced you to recommend some other tamping rod; was it in consequence of an accident?—It was in consequence of the accident the other day. We cannot get the men to use the oak sticks. We have offered to supply them with as many as they will call at the carpenter's shop for; when one has got unfit, they can have another for asking, and yet they will not do it.

6767. How did the accident occur to which you have last referred, can you state the exact cause of it?—I think that the man was charging the hole with the borer; he fired the charge.

6768. (*Mr. Holland.*) While tamping?—Yes.

6769. (*Chairman.*) Do you use cartridges?—Scarcely ever.

6770. Only in wet places?—We have no wet places. This district is very free from water; it is a very dry district; and very few cartridges are used. I should think that a dozen would last us six months.

6771. Have you ever in your experience seen a cartridge made by a miner on the spot, and then put into the hole?—Yes.

Capt. Thomas Trahair.

7073. (*Chairman.*) You have stated that accidents happen very much from the men being reckless?—Yes.

7074. But would you not consider it right at the same time that every precaution should be taken to prevent the occurrence of accidents?—Of course, and they have got everything for that purpose: for instance, in the charging of the holes we have provided wooden sticks to put in on the powder instead of brass or copper bars; some have iron bars to tamp with, but we have wooden sticks to put in the tamping on the powder.

7075. Do all the men use them?—No, they will not do so; but they ought to do so.

7076. Have they any copper tamping rods?—Yes.

7077. Is there any danger in the use of them?—Yes, I think so.

(E. b.) Blasting.

7078. Will a copper tamping rod strike fire?—They have done so.

7079. Have you seen that done?—I have seen men who have done it in our mine. We were not in the habit of using anything else; perhaps with a little brass with it.

7080. Where did you procure those copper bars?—They were made in the mine; the bottom end of it is copper, about two inches long, with a bar of iron.

7081. Might it not have been some other part of the tamping bar that struck the fire and not the copper end?—It might have been.

Mr. Alfred Chenhalls.

7137. (*Mr. St. Aubyn.*) Something has been said in the course of the evidence given to-day about tamping, and about sand being used to fill up the holes instead of stone; can you give the Commission any information upon that point?—At Botallack there is a rule laid down by the agent, at all events in his dealings with the men, that they should take sand down into the mine for tamping instead of using any stones. They think that there may be inequalities of size in the stone, and, if roughly and hastily pounded up by a hammer, it seems to me that it would produce attrition and fire more generally than the fine sand will in which there are no large cubes of felspar to cut the fuze and so endanger life.

7138. Has this plan been in operation for a long time?—Yes, for years.

7139. Has it been found to answer in all respects?—I could not say definitely that no accident has taken place in a mine whilst it has been used, but I know that where persons have neglected it in the Botallack mine a hole has gone off suddenly.

7140. But you do not know of any case in which an accident has occurred through using the sand?—I have an imperfect idea of one such case occurring, although I cannot call it to mind so as to speak definitely upon it.

7141. Are you of opinion that it would be conductive to the safety of the miners generally if the sand was more generally used?—I have a strong conviction that it would be conductive to the safety of the miners generally; it amounts to positive certainty in my own mind.

Mr. Henry Boyns.

7361. (*Chairman.*) I suppose that in all mines there is a supply of proper tamping?—Yes; in all well regulated mines.

7362. What is the bar that you have just spoken of?—We have a composition bar.

7363. To serve as a tamping rod?—Yes; the composition is copper principally and lead.

7364. With that bar can you not strike fire?—It is not supposed so.

7365. Have you ever had an accident occur from blasting?—Yes, several; but when I say that, perhaps sometimes not once a year.

7366. Do you suppose that these accidents have arisen from carelessness?—Yes; in the last case there was a great deal of carelessness; there was not proper tamping used in the first place.

7367. That you supply?—Yes; but the men take up just what comes.

7384. (*Mr. Holland.*) Do the tamping tools to which you have referred last pretty well?—Yes, they last fairly.

7385. Is the implement that you mentioned an iron rod with a composition end?—Yes.

7386. Are they nearly as durable as iron?—Yes.

7387. About how much do they cost?—We charge 1s. per bar, the copper I suppose being about sixpennyworth.

7388. What is charged for the whole bar?—1s.

7389. And you say that they last nearly as well as iron?—About the same. The men are charged a certain amount for the purpose of making them take care of them.

Capt. Stephen Harvey James.

7527. (*Chairman.*) Have you ascertained how the accident happened with these men who hurt themselves by blasting?—Yes. The one that I alluded to might have been there for a month. I do not think he was there so long. I have for many years kept the pulverized sand there for tamping, and we have always used it for tamping, and allow no person to use anything else. I have always endeavoured to impress upon the minds of the men, on the survey or before the survey, that if they attempt to use anything else and any accident happens they shall have nothing from the mine. I believe we went on for seven years and never had an accident, after introducing this sand, and at the same time I introduced oak sticks about two feet long, made of dry oak, and I requested that they would tamp the powder with them instead of with the bars. We went on for, I should think, seven years and never had a single accident. A man who had just come in, out of stupidity, or perhaps laziness, I do not know which, had taken up some stuff from the bottom of the level, and it exploded. He had but one eye, and he lost that.

(E. b.) Blasting.

7528. You think that if they used this proper tamping sand there would be no danger of igniting the powder?—If they use that proper tamping sand and the oak stick there is not the slightest danger. I am satisfied about that

7529. But the tamping sand alone without the oak stick would not be safe?—I should use the oak stick in preference to everything. I say it is sufficient for everything except, it may be, for a particularly hard drawing hole and I do not know that it would not be sufficient there.

7530. Do the men in Botallack mine use the oak stick?—Always. We charge them nothing for it, and if we found them charging a hole without it they would be dismissed.

7530*a* Have any of the men made objection to use the oak stick?—Not one. It is only from carelessness that they will get something else.

7531. I suppose the advantage of an oak stick is that the iron may strike against the rock and a spark go through the tamping, or there may be loose powder about the hole?—Yes; I think that one reason why holes explode very frequently is from there being loose powder about the hole.

7532 If you had any tamping rod which would not strike fire against the rock would it not be as good as the oak stick?—Yes; but if the oak stick is sufficient I do not think there is any reason to risk anything.

7533 Then it is your impression that a man can complete the tamping with an oak stick?—He can complete the bottom part of it with an oak stick; for the remaining part, perhaps, it would be better to have it driven a little tighter, but I think that an oak stick is sufficient for the hole.

7534. You think that in all mines provision should be made to prevent, if possible, accident by the use either of an oak stick or some other tamping-rod which will not strike fire?—Yes, I should recommend it by all means.

7535. Do the men ever use cartridges?—Yes, occasionally in a wet place, but not elsewhere.

7536. You have never known the use of cartridges to be general in a mine?—No; the powder which we have from Kennell is very large.

7537. (*Mr. Holland.*) Is it as large as coffee berries?—No, hardly, I should think. Some of it is very nearly as large as coffee berries, but I think that that is rather an excess; it is like peas just broken in two, and whole peas, and so on. Scarcely any of it will stick about the hole, but if you have very fine powder it will stick about the hole. We think that our powder is better for that reason.

7538 That very large grain powder, I suppose, hardly wants cartridges?—No, except it is in a very wet place. Our powder is, I should say, generally larger than split peas.

Capt. James Bennetts.

7743. (*Chairman.*) Have there been any accidents at either of those mines since you have been there?—One in each. A man blasted a hole in the 110 fathoms level at the Spearne Moor, about a year and a half ago; the level was straight, and he fancied that he was out of reach, and a stone struck him in the back, and he died from it. In the case of a man in the North Levant, a hole exploded about him, and he lost his eyes by means of it.

7744. What was he tamping with?—With sand that we get from Balleswidden mine, the safest that we can get in the district; we keep a stock in the mine for the

(E.)—ACCIDENTS.

(E. b.) *Blasting.*

purpose, and wooden chargers for them to put the powder in with.

7745. Do you use cartridges at all?—No; our mine is dry.

7746. How do you think that the accident happened?—I suppose that it was through neglect in putting the powder in, and that the man used iron instead of wood. They try to make all the excuses they can when an accident does happen, but we provide everything that is necessary to prevent accidents,

7747. You provide a wooden tamping rod?—Yes.

7748. Do you think that sufficient to complete the whole operation?—They generally put in a part with it, and the remainder with the iron.

7749. If there was any powder about, the iron rod might strike a light, and it might ignite below the tamping?—Yes; and it might cut the fuse.

7750. But if it cut the fuse, would it not take a longer time before it went off?—Yes, I suppose it would; but I do not think any one can account for how the holes fire sometimes.

7751. If you had a rod which would not strike fire would it not ensure safety?—If there was a grain of powder, and it ignited, it would not go to the bottom. A grain after the hole gets two-thirds filled would not go to the bottom; and there is no way of the hole being fired except through the fuse being out.

7752. Is there not a good deal of powder mixed up with the tamping?—No; but powder sometimes sticks to the side of the hole, which is generally cleaned out.

7753. If that was neglected it might cause an accident?—Yes.

Capt. John Carthew.

7829. (*Chairman.*) Do you supply them with any particular tamping rod?—We supply them always with a copper tamping rod.

7830. Has it a copper end?—Copper is put on to the iron, we always provide copper; we provide hard wood for any hole they wish to tamp with, and copper as well; we tell them particularly never to use iron.

7831. Do you suppose that the man to whom the accident happened had used an iron tamping rod?—I do not know really, I never heard that he had.

7832. Do you suppose that he had gone back to the hole too soon after the explosion?—I cannot recollect the particulars, but there was no complaint made that anything was out of the common way with him.

Capt. William Hollow.

8028. (*Chairman.*) Do you take any precautions to prevent accidents from blasting?—No, not particularly. I have been on the mine now seven years, and we have not had a single accident of any sort or kind from blasting.

8029. Are the men supplied with any particular tamping rods?—They are supplied with a piece of hard wood to settle down the powder before putting in the iron, they have that from the carpenter's shop. It is our rule, that if any accident should occur, and they do not happen to have one of these hard wooden rods, they do not come upon any pay from the club.

8030. Is that in the rules?—I do not know whether it is one of the printed rules, but that has been read out at the time of setting, several times.

8031. But they use for finishing off the hole an iron tamping rod?—Yes. Our ground is all dry ground, perhaps that may be in favour of our not having such accidents as there might be in wet ground.

Capt. Richard James.

8393. (*Chairman.*) Have you ever seen any other bar used?—Yes; I have seen the copper bar; they are put up to the iron bar. They have a piece of the end of it that is copper, and I have seen fire come from that; a kind of blue fire, something like brimstone.

8394. (*Mr. Davey.*) Was that from the copper or from the alloy?—No; it was had for copper. We understood it to be copper.

8395. (*Mr. Holland.*) You do not think it was the shank of the tool that caused it?—No; we tried it outside the hole to see if it would strike fire, and it was a kind of dead blue fire.

8396. (*Chairman.*) Do you use cartridges in the mines with which you are connected?—No; but we have done.

8397. Does an accident ever happen in consequence of the powder lying round the edges of the hole not being properly swabbed out?—Not generally; that was in days gone by more than now. We always take care to clean it out with this wooden rod; we dip it in water and wipe out the hole with the end of it.

(E. b.) *Blasting.*

8429. (*Mr. St. Aubyn.*) Is it not possible that that might have occurred from that part of the rod which was made of iron striking against the sides of the hole?—It was not tried in a hole, but it was tried outside in order to see whether it would strike fire; it was the understanding that it would not strike fire, but we tried it against some of the most fiery stones, to see whether the copper would strike fire, and we saw little dull sparks.

8430. Do you think that they would have ignited gunpowder?—Yes, I think there was fire enough for that.

8431. You believe that those sparks were produced by the contact of the copper with the stone?—Yes, it was at the bottom that we tried purposely.

8432. (*Mr. Kendall.*) The sparks were not of the same colour as those which are produced by iron?—No, they were little blue sparks.

8433. (*Mr. Holland.*) Did it look at all like the sort of bluecish flash that is produced by the rubbing of two fire stones together?—Yes.

Capt. Charles Thomas.

8744. (*Chairman.*) Do you take any special precautions against accidents arising from blasting by employing any particular kind of tamping rod or cartridge?—We do not use cartridges much; never, excepting when we have wet ground and water to deal with

8745. Is the tamping rod that you allow to be used of a particular kind?—We use a safety fuse and an iron rod.

8746. You do not use any wooden rod?—Yes, to pack in the powder, always.

8747. Is each man supplied with an oaken rod to put in the powder with?—He may have it by going to the carpenter's shop for it; they do not have them prepared for them, but every man may have it, and every man has what is called a swabbing stick; the lower end of that is roughed up a little to clean out the hole before they put in the powder; the upper end ought always to be kept in condition to pack down the powder with.

8748. Is any penalty imposed upon the miners for not using it?—No; but we charge them, because at Calvadnack mine, six months ago only, some of the men persisted in packing in the powder with an iron bar instead of using a wooden rod; they were warned of it, but they still persisted in it, until at last two of them were very seriously wounded in the very act of packing in the powder; before they had tamped it at all the powder exploded and burned them very severely.

8749. Is it not desirable to use a tamping rod which would not produce sparks by striking against the rock?—I do not remember a single instance in which the premature blasting of a hole since we have had the safety fuze has been occasioned by striking fire against the side of the hole

8750. How have the accidents occurred?—Either by putting in the powder first of all with an iron rod, or the first or second tamping perhaps, when they have not packed down the powder sufficiently with the wooden rod; when they first come to put in the first tamping, and that first tamping is forced in upon the powder, it may explode sometimes by undue pressure, that is what we have thought sometimes.

8751. Your impression is, that explosions sometimes take place by the mere compression of the air?—Yes, that might have been lodged in with the powder before, that opinion prevails rather extensively amongst miners.

Capt. William Teague.

9380. (*Chairman.*) But you have a good many pensioners by reason of accident?—Yes, several. We were rather unfortunate about two years since, three or four holes exploded, and it threw some men on the club.

9381. Do you take any particular precautions more than other mines with regard to firing; do you use cartridges?—No, we have had them, but the men will not take them.

9382. What do the men use for filling in the powder?—Iron; that is not used for filling in the powder, but it is used for filling in the tamping on the powder.

9383. (*Mr. Holland.*) Do you put in the powder with a scoop?—With a scoop or the top of the powder can.

b.) Blast-

9384. (*Chairman.*) Can you ascertain at all how those accidents happened?—No. The last two that have come under my notice have been with the third laying of the tamping.

9385. It has gone off then?—Yes.

9386. And you cannot account for it?—I cannot account for it.

9387. Do you think that it could have cut the fuse?—I cannot say at all; it may have been that or may not.

9388. Might it have been from powder lying about if the hole was not properly swabbed out?—It may have been, it is a very rare occurrence that it all exploded with the third laying of tamping.

Mr. JOSEPH JEWELL.

9659. (*Chairman.*) Have any accidents occurred from blasting during the last three years?—One occurred in South Tolgue about two months ago.

9660. Were you able to ascertain the cause of that accident?—I believe it was through carelessness on the part of the man himself.

9661. In what way?—From putting in the tamping on the powder with an iron rod; that is not allowed to be done, nor in any of the other mines. He confessed it afterwards. His sight has been injured for a little while, but he will be able to work again in a few days.

9662. He has not lost his sight?—No.

9663. Do you supply the miners with wooden rods for the purpose of cleaning the hole previous to and after charging it with powder, not for tamping?—Yes; every man in the mines has got one.

9664. I suppose the accident occurred from the iron coming in contact with the gravel and striking a spark?—Yes; there have been instances when the fuze has been cut by the ramming bar, the "iron" as they call it, but not in our mines that I have seen or have known.

Capt. JAMES POPE.

9895. Do you use cartridges?—We do sometimes, but seldom; the men make their own cartridges with us; they make them of paper.

9896. Do they always use that?—Nearly so.

Capt. JOSEPH COCK.

10,008. (*Chairman.*) Have you ever had an accident in blasting within the last three years?—Yes; one. We had one in May 1861.

10,009. Did you ascertain how that was occasioned?—By putting the tamping rod on the third floor of tamping.

10,010. How is that to be avoided?—We can hardly tell in those cases; some miners have said one thing and some have said another. One of the men was not killed stone dead; he lived about an hour after he was hurt, and he spoke several times; he said that he was tamping as easy as any hole that he ever tamped in our ground, and he did not know the cause.

10,011. He was tamping with an iron tamping rod?—Yes.

10,012. What kind of tamping had he?—I fancy that it was some blue killas beat up fine. I am not certain, but I think that that was it.

GEORGE SMITH, Esq., LLD.

10,224. (*Chairman.*) There are still accidents from blasting?—There are.

10,225. And sometimes from cutting the fuse?—I have never known an accident to arise from cutting the fuse. I have known the fuse cut, and explosion to take place, but the miners never use tamping so hard, and hammer it so violently very near the charge as to cut the fuse; and as the moment the fuse is cut, if it ignites, the smoke ascends from the hole, they have time to get away to some distance. There must be some warning; even the burning of an inch of the fuse would allow the men to go several yards.

10,226. Have you ever turned your attention to what the accidents which still take place from blasting arise from principally?—I think that the larger number of the accidents now arising from blasting arise from what they call picking out the hole, when the fire is not conveyed to the charge. If the fuse is carelessly inserted into the charge, the tamping settles the charge down so as to separate it from the fuse, and then, although the fuse may have a very perfect action, the fire is not conveyed to the gunpowder, consequently the hole does not explode, and they pick it out, in doing which they sometimes get to the charge, and mix up the gunpowder with the hard tamping matter, and explosion takes place. (E. b.) *Blasting.*

10,227. What instrument do they use to pick out a hole which has not gone off?—A small sharp iron; and sometimes I have known them bore it out with the borer; and I have known them press down the charge with an iron tamping bar in a dry hole, with dry gunpowder at the bottom of the hole, and they have used that instead of a piece of wood.

10,228. Could no instrument be invented to use either for picking out a hole or for driving the tamping, which would not create sparks by contact with the stone?—My opinion is that a hole never ought to be picked out under any circumstances; and in most of the mines there is a rule to the effect that on any accident occurring from picking out a hole no relief is to be given from the club. I think it is always better that a new hole should be bored.

10,229. But a man having gone to the labour of cutting out a hole, it is natural that he should like to make use of it?—Yes.

10,230. Could you enforce any such rule as you mention?—I am afraid not, so as to make it universally operative. Another cause of accidents is, I believe, the neglect to use what they call a wet swabbing stick, after the charge is inserted in the hole. A great many of these causes would be prevented by the use of cartridges. They very seldom bore the hole perpendicularly, but give it such a direction as shall effect their purpose in blasting the largest quantity of ground. Then if it is put down in a sloping direction, and the charge is inserted by pouring the gunpowder into the hole, the upper part of the gunpowder will of course be considerably above where the surface of the charge is, when it is properly pressed. In every case after the charge is inserted, it should be carefully pressed down until its upper surface is at right angles with the direction of the hole; a first layer of soft tamping should then be put on the charge, and then a damp swabbing stick put in, so as to destroy any grains of powder that may still remain about the sides of the hole. Unless this is carefully done I believe no tamping bar whatever will ensure the safety of the miner. The powder against the sides of the hole would be liable to take fire and convey it to the charge.

10,231. Would copper coming in contact with the lode or the country create a spark?—No; but the pulverising of the tamping against the sides of the hole might.

10,232. (*Mr. Holland.*) You think that the two materials rubbed together might produce fire?—Yes.

10,233. Are you satisfied of that?—I have not a doubt of it. If they used tamping, as some of the mines prepare it, I do not think that that would apply, but I know that hard tamping is used which would strike fire.

10,234. (*Mr. Kendall.*) Supposing that you had a metallic bar which would not strike fire, and that that metallic bar struck off a bit of hard ironstone, and brought it in contact with something very hard, such as flint, in the tamping material, would those two bits jammed together ignite?—I have no doubt of it. At the same time I believe that if you had a tamping bar, the lower part of which would not strike fire, you would diminish the cause of accidents very seriously, but I do not think that it would entirely prevent them.

10,235. (*Chairman.*) You think that a cartridge also would be an advantage in the way of safety?—I think that it would, and generally speaking, I believe the holes being usually damp, the cartridges would pay for themselves in the saving of gunpowder.

10,236. What objection do you suppose would be urged against the general use of cartridges?—Several. In the first place there would be an objection to them on account of their size. The holes are bored of different sizes. Sometimes at the beginning of a *core* the holes are different from what they are at the end, on account of the wearing of the borers, and if a small cartridge is put into a large hole it will crush and break under the operation of tamping. There are several inconveniences which stand in the way, especially as the miners' habits are so confirmed in the insertion of the gunpowder in the ordinary manner.

(E. b.) Blasting.

10,237. Those habits are, perhaps, one of the greatest difficulties to overcome?—I believe so.

10,238. You have of course seen a cartridge made by the men of brown paper on the spot?—Yes.

10,239. And placed on a stick which fits into the hole?—Yes, that would obviate the thing to some extent.

10,240. Do you think that there are any other objections which can be urged against the use of cartridges than what you have stated?—No, I am not aware of any other, save and except the labour of providing them, and the inconvenience connected with them, which I have mentioned.

Charles Fox, Esq.

10,538. (*Mr. Holland.*) With respect to tamping, do not you think that it would be a great advantage to substitute a bronze for an iron tamping tool?—Yes, that has always been acknowledged; That was Sir Humphrey Davy's introduction; that would be a very valuable precaution, and it would avoid many of those accidents which arise.

Capt. John Taylor.

11,561. (*Chairman.*) Supposing they neglected to swab away the powder at the edge of the hole, would not that be dangerous?—Yes. After the powder is put in the hole it should always be wetted with the swab stick.

11,562. If that were neglected might it create an accident?—Yes; and I believe that many accidents have occurred owing to the neglect of it.

11,563. Did you ever know or hear of any accident from driving the tamping down hard with an iron rod?—I think that there can be no danger of that. You may drive your tamping as hard as necessary and as hard as you please after the first laying of tamping has settled. The first thing that should be put in upon naked powder should be a little something very soft, and if the tamping is at all sparry it is very dangerous to settle that much.

11,564. Would it be dangerous to use an iron rod with sparry tamping?—Yes,

11,565. How would the powder ignite; would it be by the contact of the steel in the tamping with the rod or the country?—If the tamping is sparry it might cause ignition by rubbing against the side of the hole, or if you used iron it might strike fire. I think that if you even settled tamping with a wooden stick it might ignite by striking against the side of the hole.

11,566. (*Mr. Holland.*) But that by putting soft stuff it is safe?—You should never put a rough spar upon naked powder, no matter what you settle it with.

11,567. (*Chairman.*) What do you supply the men with as tamping?—In Wendron Consols we use mostly cartridges or tubes. Sometimes one and sometimes the other.

11,568. Do you mean paper tubes made by the men?—No; they are a sort of vellum cloth made waterproof. They are sent to us empty and the miners fill them; they put such a quantity of powder as may be required. Waddings with those are always sent. The wadding is generally made of cotton waste.

11,569. Supposing that the hole is small, and that the cartridge is too large for the hole, do you think that by pressing down that cartridge into the hole you could ignite it?—Some have thought so, but I can hardly conceive how that is possible if you are settling your cartridge with wood. I do not think that that is likely to be the case.

11,570. For safety you would recommend cartridges and waste for tamping?—I have no objection at all if you have dry ground to the naked powder.

11,571. Do you not think that there is always a chance that the men may leave some along the edge?—They must never do that.

11,572. But is there not the risk of it?—There is no need of it. The men must use a swab stick and wipe the hole.

Capt. James Phillips.

11,725. (*Chairman.*) Do they fill in with them?—No, they generally use what we call the swabsticks, and swab out the hole, and then they run in the powder, and use the swabstick again on the powder, but our men are ordered to take some hard clay to put in first upon the powder, that is what we use in the mine, for, otherwise, they would use many different things in the mine, but that is a hard substance to go down with the swab stick.

(E. b.) Blasting.

11,726. Where is the clay that you have just mentioned obtained from?—We pay about 7s. a ton for it; we get it down here; I do not know where, exactly, but the barges bring it up.

11,727. Is any charge for that made in the bal bill?—No, the miners get the clay free.

11,728. Do they use an iron tamping rod?—Yes.

Mr. William Goddan.

12,101. (*Chairman.*) No cartridges?—No, we generally make paper bags.

12,102. You make a paper cartridge?—Yes.

12,103, Do you always use that?—Yes.

12,104. The men make no objection to that?—Not at all, they like it better than Copeland's cartridges.

12,105. Do they like it better than loose powder?—Yes, we could not shoot with dry powder unless we made bags of paper.

12,106. Do you never shoot with loose powder?—Yes, in dry ground.

12,107. It is only in wet ground that you use the paper?—Yes.

12,108. (*Mr. Holland.*) Do you prefer powder to bags in dry ground?—Yes.

12,109. Why?—Because the paper takes up more room in the hole; we cannot get the charge to the bottom.

Mr. James Richards, Devon Great Consols Mine.

18,780. (*Chairman.*) Have you ever had any accidents from blasting?—Yes, some.

18,781. How do you think that that arises?—From careless tamping.

18,782. Do you supply the tamping materials?—Yes. There is always plenty to be found in the mine.

18,783. Have the men to take it with them?—Yes. They use the mallet instead of the hammer in some cases where accidents have happened. Since the first or second accident we have used copper for tamping bars.

18,784. Are they merely tipped or cased with copper?—They are shod with copper; the upper part is iron.

18,785. Is it hard enough?—Quite; it is not necessary to use a hard substance for tamping.

18,786. Do you think that there would be no danger of fire if merely the point was covered with copper?—It would be quite sufficient.

18,787. Would not the rubbing of the iron part of the bar against the side be likely to cause a spark?—It would not if the bottom part of the bar is bigger than the upper part. We have had an accident of that kind, but it had been traced to the party looking into the hole with a candle.

18,788. Have you ever had an accident while a man has been using a copper tamping rod?—No, never.

18,795. (*Mr. Holland.*) We were told in the west of Cornwall that copper tamping rods were not perfectly safe?—We have always found them safe with us.

18,796. What is your rock?—The clay slate, but the lode is a mixture of caples and mundic and quartz; that is where the tamping chiefly is; we do not do much in the country; our lode is very large. It is my opinion that a copper tamping rod is perfectly safe with proper tamping; if bad tamping is used I believe there is a danger in using any bar.

Mr. Joseph Matthews.

18,908. (*Mr. Kendall.*) Are accidents so frequent as they used to be?—By no means; the number of accidents from gunpowder are, I think, reduced two thirds.

18,909. I suppose the adventurers take more care in the appliances which they use?—We do all we can to render their work as little hazardous to life as possible.

(E.)—ACCIDENTS.

(c.) FALLING AWAY FROM THE LADDERS.

(E. c.) Falling men from Ladders.

Mr. Thomas Trevelyan.

1141. (*Chairman.*) During the eleven years, how many accidents have there been?—Two.

1142. What did they occur from?—The first was a young man killed by a piece of ground turning out at the bank of the stope. I only passed the stope five minutes before he was killed It was a projecting rock, and I had no sooner gone over the stope than it proved that those two rocks were what we call a-head; they were fast together by the head, so that the weight came over, and came down upon the young man and killed him instantaneously. The other death occurred through a man slipping in descending, and he was killed.

1143. There is always a chance of falling away from the ladder?—Yes, and sometimes a short distance might kill a man, depending upon whether he pitches upon his head or otherwise.

Mr. Peter Clymo.

2280. (*Chairman.*) Do they ever fall away from the ladders?—It is the case sometimes, but not very often.

2281. By what is that occasioned,—by carelessness? —I cannot tell. They sometimes carry a pick down in their hands, and then if a man has not pretty long fingers he has not much hold upon the ladder-stay, and they slip in that way.

Mr. John Pearce.

4097. (*Chairman.*) Do any accidents occur from falling away from the ladders?—Yes; I have known many cases of that kind.

4098. How have those accidents occurred?—Sometimes from a man thinking of one thing and doing another; perhaps he is speaking to another person, or there may be a defective bar.

4099. Are the bars of iron or of wood?—They are of both; some ladders are made entirely of iron staves, some have wood and iron; I have seen them made all of wood, but that is rare.

4100. When the miners fall from the ladders are they generally killed?—As a rule I should say no.

4101. What precautions are taken to see that the wood of which the staves are made does not get into a decayed state?—They are passing up and down every day, and the agents can observe it if it is.

4102. Still they may break away?—Yes.

4103. Is it not desirable to have all iron staves?—I should say so myself.

Mr. John Richards.

9538. (*Chairman.*) I understand that accidents are frequent, such as men falling from one level to another; do those accidents ever occur in your mine?—Very seldom; we had one man who fell in a shaft a little while ago.

9539. Was he climbing at the time?—No, and he had a candle alight with him.

9540. How did the accident happen?—He slipped his foot or his hand.

(d.) FALL OF THE ROCK.

(E. d.) Fall of Rock.

Mr. T. Trevillion.

1142. (*Chairman.*) What did they occur from?—The first was a young man killed by a piece of ground turning out at the bank of the stope I only passed the stope five minutes before he was killed. It was a projecting rock, and I had no sooner gone over the stope than it proved that those two rocks were what we call a-head; they were fast together by the head, so that the weight came over, and came down upon the young man, and killed him instantaneously. The other death occurred through a man slipping in descending, and he was killed.

Mr. Joseph Phillips Nicholls

19,515. (*Mr. Leveson Gower.*) Since when?—That is in all the working, I suppose, within the last nine years. Our accidents are very scarce.

19,516. When was the last?—In the beginning of January or the latter end of December.

10,517. What was the cause of that accident?—A scale of ground.

19,518. Did you work yourself in a mine when you were young?—Yes, from a boy of twelve years old.

(e.) FALL OF STONE OR KIBBLE.

(E. e.) Fall of Stone or Kibble.

Mr. James Seccombe.

1391. (*Chairman.*) Is there any danger in the use of kibbles from the stuff falling out?—If they are drawing very fast, they might hitch one into the other; but the men generally manage to have the winze stopped when they are passing through the shaft, otherwise it would be attended with danger, and stones might, by chance, get into the other shaft

1392. Have you ever known such a thing as that occur?—I have known stones come in.

1393. Therefore the skip would appear to be the safest?—The skip is rather the safest. While the chain and everything is all correct, there is not the same liability to hitch or entangle as the kibbles would.

A Miner. (No. 5.)

3108. (*Mr. A. Bruce.*) Did you ever know of any accident?—Yes.

3109. Of what sort?—I do not know that I have heard of a man being killed, but some have been injured by the chain breaking when men were going up; some were rather careless, and being rather behind time they wanted to make haste, and thought that they might just slip up in a certain place, and the chain has broken, and the stones have come down, out of the full waggon as it was passing down, and have struck them, but not seriously. But it might be better if the footways were in a separate place without any communication with the wem The kibble is very heavy with the waggon; it goes from side to side, and would smash everything it came in contact with The mine in which I work now, I believe, is very good for that; there are so many communications, exceptional shafts.

Capt. T. Richards.

9022. (*Mr. St. Aubyn.*) In any of the mines of which you have the management, do the men use the skip to come up with?—No; we do not allow it. I think it is unsafe unless a shaft is set aside for it entirely. I do not think that stuff drawing and man drawing should go on in the same shaft.

9023. (*Mr Holland.*) What danger do you apprehend from that?—In drawing stuff, with all the care which may be used, stones may fall into spaces, and may fall upon the men coming up.

(f.) FALLING FROM ONE LEVEL TO ANOTHER.

(E. f.) Falling from one Level to another.

Capt. Joseph Cock.

10,042. (*Chairman.*) I see that by the return several men have been killed by falling from one level to another, falling from the 70 fathoms to the 150 fathoms; how does that happen?—Sometimes it happens in the dark, there being no light.

10,043. Several have been killed in that way?—There have been a good many boys and some men. I believe that in nine cases out of ten, men and boys too are killed by heedlessness, by not taking proper care.

(g.) STATE OF LEVELS AND WORKS UNDERGROUND.

(E. g.) State of Levels and Works underground.

Mr. John Richards.

9526. (*Chairman.*) But how would they go along the level, would it be safe to go along the level without a light?—Yes, the light would, of course, be preferable, but repeatedly the miners have to walk a good way in the dark to get a light, but not since the present matches have been in use, they generally carry them with them.

9528. Did you ever know a man to find his way from the bottom of a mine to the top in the dark?—Yes, it is from the use of it.

9529. Are all the openings between one level and the other well protected?—Very well.

9532. Is it perfectly safe to go along one of those levels without a light?—Certainly to people who are used to it.

9535. In the dark?—Yes; but you will not find so much darkness down there since the lucifer matches have been in use.

(E.)—ACCIDENTS.

(E. *h.*) *Timber Work in Mines.*

(*h.*) TIMBER WORK IN MINES.

Mr. Thomas Trevelyan.

1145. (*Chairman.*) Is there any periodical inspection of the ladders?—We keep a man to examine all the timber-work daily, he is kept purposely for that.

Capt. Zacharias Williams.

11,823. (*Chairman.*) Does the timber decay at all in your mine?—Yes, there is a decay of timber in places, but we do carefully attend to that in securing it.

11,824. In the old part of the mine which communicates with the present workings, is the timber decayed at all?—No; the greatest decay of timber that we have is in the western part of the mine.

11,825. (*Mr. Kendall.*) What do you imagine the decay of the wood is owing to?—I cannot tell.

11,832. (*Chairman.*) Does the decay of the timber take place where a level or a shaft is damp?—Yes, more particularly; but it sometimes decays where it is dry.

11,833. (*Mr. Holland.*) Does it decay most where it is dry?—I do not think it does; it decays where it is as dry as it is here.

11,834. It will decay also where it is damp?—Yes; where it is damp it goes all to a mummy, so that you can squeeze it up in your hand.

(E. *i.*) *Bursting of Boilers.*

(*i.*) BURSTING OF BOILERS.

Mr. Thomas Trevelyan.

1106. (*Chairman.*) Have you ever known a boiler burst?—Yes.

1107. In these works?—Yes.

1108. Was there any loss of life occasioned?—A man was retreating from that boiler-house; the engine was not working: we do not work it by night; we work it in the day. The steam was got up in the morning, and some men were changing there, and the engine man had not commenced working, and he had got the steam rather higher than it ought to be. The men had left the place, and this poor man had left also as they thought, but the steam was buzzing up rather fast, and he wanted to go back; his comrades did not want him to rush back while the steam was rather high, but he went back, and in retreating again the boiler burst; the engine was not working.

1109. If there had been more men working in the boiler house at that time, the loss of life might have been serious?—Of course it would have been, a boiler cannot burst without doing damage if men are there.

A Miner.

1983. (*Mr. F. Egerton.*) Do you think that there is any cause for that fear?—It has occurred that boilers have blown up, and many lives have been sacrificed in consequence. I have known it happen in the county. I was very near one, one morning, in the Polherro Consols mine, in St Agnes, where several men were on the boiler, and one end was blown out. I do not know that either one lost his life, but several men were considerably injured.

Capt. Richard Boyns.

6875. (*Chairman.*) You never had a boiler explosion; —No; but I think that better attention ought to be paid to the cleansing of boilers. We keep a memorandum of it in our mine, and we work by rule in that respect.

6876. How often do you think that a boiler should be cleansed out?—I think that it ought to be cleansed every four months; it depends upon the condition of the water; there is a little trouble in it but a great deal of safety. I think the cleansing should be attended to regularly, to see that the thing is all right, and how the water is acting on the iron. We keep a regular entry of the cleansing of every engine in the mine; we have seven working. I make our engineer keep an account of this, so that I may refer to it at any time.

6877. Do you think that that is generally done?—No, I think not. It is my opinion that the time of the boiler being cleansed should be recorded in the counting house. Engineers are inclined to shrink from it, as it is hot trying work, but it is work that should never be neglected.

6878. (*Mr. Holland.*) Is once in four months enough for safety when the water is impure; do you of know any case where the water is so bad and so full of sediment as to require its being done oftener than once in four months?—I know that there would be a thin scab inside the boiler in four months; and if so, the sooner it is removed the better, both for safety and economy. There is a great deal of saving and a great deal of safety in this. I verily believe that in the average of mines the time is twelve months instead of four. A great many men will, what they call, blow out the boiler, but there is no safety in that.

(E. *i.*) *Bursting of Boilers.*

Mr. Henry Boyns.

7349. (*Chairman.*) Where did that happen?—At Pendeen Consols.

7350. When did it happen?—About 12 months since.

7351. Was any man killed upon that occasion?—One man was, but he was not connected with the engine, he was out in the fields and he was killed.

7352. Therefore there is always a liability to danger if the men change their clothes in the boiler house?—Yes; we think so.

7353. How often do you clean out the boilers?—Somewhere about once a year.

7354. Is there any record kept of the time when they are cleaned out?—Yes; the date is put down at once.

7355. How do you judge when it is necessary to clean them out?—From practice, knowing the quality of the water that goes into them. When we cleanse a boiler at any given time, we judge accordingly.

7356. Do you clean out the boilers regularly once a year?—That depends on the quality of the water and the quantity of steam generated in them, and whether the foulness of the water acts chemically on the iron.

Capt. James Bennetts.

7766. (*Chairman.*) How often is it cleaned out?—It depends upon the quality of the water that we have. I suppose upon the average once in a year; but then we condense with clear water. If the water was foul we should clean out the boiler oftener. We have a clear stream of water which runs through the adit level, and that is employed for the purpose of condensing with.

7772. And a gauge to show the quantity of water?—No; we have no gauge, but we have one tap over the other, and the lower tap is in the tube of the boiler, and we can tell how high the water is.

Mr. Samuel Higgs.

7941. (*Chairman.*) Whenever a boiler is cleaned out is there a note kept in the books?—No.

7942. There is no particular register of it?—No; a charge is generally made.

7943. But there is no regular register of the period when it is done?—No, it is within the memory of the people whose duty it is. Some boilers require cleansing every two months and others can run for six months, or even twelve.

Capt. William Hollow.

8037. (*Chairman.*) Have you any water gauge?—No, we have what we call gauge cocks.

8038. So that it must rest with the engine man to try the gauge cock occasionally?—Yes.

8039. How often is he bound to try it?—I do not know that he is particularly bound, he must use his own judgment. I do not know that we have any specified time that he shall try it.

8040. When another man takes his place, is he bound to try it?—It is the rule that when a man turns in he is to try the gauge cocks the moment he comes in.

8041. But there is no way of ascertaining whether that is done?—No. Sometimes we agents are on the spot, and we see that it is done.

8042. How often are your boilers cleaned out?—Once in two or three months, just when it suits. The water with which we condense is good water, in fact pretty nearly good enough to drink; so that once in three months is just about as often as we require it.

8043. Do you test the boiler in any way in order to see whether it is necessary to clean it out?—No; we make a rule just when it suits from two months to ten weeks.

8044. (*Mr. Holland.*) Do you look at the blow-out water?—Yes, we use our own judgment as to that.

8045. (*Chairman.*) Do you keep any record of the times when you clean the boilers?—No other than our rough cost book, when the charge is made for cleansing, and we charge the money, so much for cleansing; but we find that it is about once in three months.

(E.)—ACCIDENTS.

i.) *Bursting Boilers.*

8058. (*Mr. Holland.*) Do not boiler plates constantly weaken?—Yes, certainly they do.

8059. Then you have no security that they are not getting dangerously weak, except what you observe when you go in?—We have not; we work at very low pressure.

8060. At what pressure do you work?—We do not work at more than about 30 lbs. to the inch.

8061. I suppose that you have a float to govern the feed pipe?—Yes.

8062. Whose business is it to see that that is all right?—It belongs to me as the agent.

8063. Is it carefully looked after?—Yes.

8064. Regularly?—Yes.

8065. Are the safety valves regularly looked after to see that they do not stick?—Yes, I generally test them every day or every other day.

8066. Have you one or two safety valves to each boiler?—We have only one to each.

8067. Are the boilers connected?—Yes.

8068. There is the same steam pipe for both boilers?—Yes.

8069. Do you think that that is safe. Is that common in Cornwall?—Yes; it depends upon the pressure principally, I should say. It depends on the state of the mine. Where you have four or five boilers, I think that it would be necessary that they should be kept separate at times. We are so easy, compared with the eastern mines, at least our water charges and our mines are so easy, that we think everything is safe.

8090. (*Mr. Davey.*) Would it in your opinion be necessary or desirable to have the gauges which you say you have seen in other mines?—I do not think that they would be at all amiss.

8091. Would they add considerably to the security of yourself and the engine men?—They are like every other thing, they require looking after, but I think that they would not be amiss.

8092. Do you not think that they would add to the security of the mine?—Yes. I have seen them in steamers, and so on, and I think that they would add to the safety of the enginemen, and of ourselves, because very often they would see the gauge when they might be too lazy to try the cock. Those gauges are not at all costly; I think that the great mistake very often is that parties are put to work the engines who are not competent.

8093. (*Chairman.*) And therefore every indicator of danger would be of advantage to an inexperienced man?—Yes.

Capt. WILLIAM STEVENS.

8171. (*Chairman.*) How often do you examine the boilers?—We examine them every day.

8172. How often do you clean them out?—Once in about three months.

8173. Is each boiler cleaned out once in every three months?—Yes.

8174. Is there any record kept of the time when they have been cleaned out?—Yes, our books will tell. We pay the men for doing so.

8175. Does the water used cause corrosion, or is it in any way injurious?—The water that we use is very good water.

8176. Has an accident never occurred from the explosion of a boiler?—No.

Capt. RICHARD JAMES.

8410. (*Chairman.*) How often do you clean the boilers out?—We clean the boilers out really once a month, but we cleanse them throughout once in two months. Once a month we take out the tap in the bottom of the boiler, and then all that is in it rushes out, and then at the end of two months we cleanse them altogether, and get into the boilers and clean out the flues by the side of the boilers.

8411. Do you test the boilers by any means?—No, we have no means of testing them.

8412. Cannot you test a boiler with cold water?—Yes, but we never did; we examine a boiler to see if everything is right.

8413. (*Chairman.*) Have the men any means of ascertaining whether there is an insufficient quantity of water in the boiler?—No other means except the two gauge cocks. The bottom one is four inches above the fire take, and the top one is four inches over that again, so that if we have water at the bottom cock, it is then four inches over the tube; in one boiler in Wheal Margery we have really eight inches there, which is rather unusual.

(E. i.) *Bursting of Boilers.*

8414. (*Mr. Holland.*) How long would that be evaporating?—About two hours. We have got a rule by which we never allow a man, whether he is by night or by day, supposing another man's core is up this morning, to go in unless he tries the cocks and finds that the feed is up flush to the cocks, and if it is not he has to come then and give us the result, and say why he does not take charge of his work: we do not let him take charge unless he finds that the feed is up to the proper place.

Mr. JOHN NANCARROW.

8517. (*Chairman.*) How often do you clean them out?—Every two or three months.

8518. Is there no fixed time for cleaning them out?—No; that is at the option of the agents, but we do not allow it to go beyond three months, except that we have occasionally at one engine gone as far as four months; but our water there is pure spring water, and in fact the men drink it underground; they carry it down with them; they actually take the water that is brought into the dry for them to wash with down with them into the mine. There is no corrosive quality in it.

8519. When you clean a boiler out do you examine it to see whether it is in a sound state?—Yes, we examine it.

8520. Are the rivets carefully looked after?—Yes, we look at them occasionally, but our boilers, I suppose, have been worked for 30 years, and they do not seem to corrode at all.

Capt. CHARLES THOMAS.

8795. (*Chairman.*) Have you any rules as to the time when the boilers should be cleaned out?—It is left with the engineers generally. If they say that a boiler ought to be cleaned out it is always attended to. There is an engineer in charge of all the machinery in every mine.

8796. How does he ascertain when it becomes necessary to clean out the boilers?—The flues are outside the boilers, where all the fire is passing along, and it can be ascertained from the draught. If it is choked, then it is time to clean it out; but in the mines here there is but very little sediment in the boilers.

8797. Have they any means of testing a boiler, whether it is quite safe, or whether the plates have become weaker from any corrosion having taken place?—No; unless by stopping it.

8798. Have you heard of boiler explosions in the county?—Yes; and those we believe to have occurred universally, or with scarcely an exception, on account of the boilers not being kept full enough of water. When the tube has been covered with water we have never heard of an explosion.

8799. How can it be ascertained that it is so?—They have cocks at the level of the tube.

8800. Is it to be ascertained only by that means?—There is no other test than that here. We formerly had a buoy with an iron spill working through a collar, so as to show the depth of water in the boiler.

8801. Have you ever seen a glass tube used for testing the boilers?—We have not got them in any of our mines.

8802. Then everything seems to depend upon the man who is in charge of the boilers, and whether he tests properly the quantity of water in them?—Yes, that is all.

8803. Are the men who have charge of the boilers experienced engineers, or are they sometimes men whom you have been obliged to put to work at grass?—They have scarcely any of them been trained to become engineers. They are men who have been employed in other departments of the mine who have been chosen—men in perfect health and strength, to go to work at the engines. Sometimes their health will fail a little. We have some cases of that kind in Dolcoath mine in working small engines. They are not very strong, but they are perfectly able to work those small machines.

8804. Are there two safety valves to your boilers?—There is one, generally speaking, to each boiler.

8805. Do you not as manager receive any report as to the time when the boilers are cleaned out?—No; there is no regular order.

(E. i.) *Bursting of Boilers.*

Capt. Thomas Richards.

8940. (*Chairman.*) With regard to the boilers, have you any stated time for cleaning them out?—That depends upon what mine it is. In some mines we cleanse them out every month, and in some mines we do not cleanse them out so frequently; it is according to the quality of the water; not only is it apparent to the eye, but as to the chemical ingredients that that water is composed of, it is dangerous to work too long.

8941. How do you ascertain that; by experience?—Yes, from experience; and we know what the action of the water is on the pumps and on the boilers.

8942. When you find that that has taken place, I presume the boilers are cleaned out oftener?—Yes.

8943. Who is it that attends to that matter?—The engineer is expected to watch over it; but, as a rule, we look narrowly into it. I look into that, and as a rule we pay proper attention to the boilers.

8949. (*Mr. Holland.*) Have you any means besides the cocks of ascertaining the quantity of water in a boiler?—Yes, there are water gauges to some of the boilers.

8950. Was there one to the boiler you have mentioned?—No; but I think that every boiler in the county ought to have a water gauge if they only knew how to work them. The difficulty arises from want of experience. If they are put in and they do not answer, there is nothing wrong; but it is for the want of knowing how to deal with them. If they can use water gauges to locomotive engines, working at 120 lbs. to an inch, surely they can to engines working 40 lbs. to an inch.

8951. How many safety valves are there to the boilers generally?—There is oftener one than two.

8952. Is it not the practice to have two safety valves?—We only have two safety valves on the same branch opposite. I think that all the safety valves should be kept under lock and key, so that no one should have anything to do with them. I think that the boilers require a great deal of attention.

8953. Have you carried that out in any mine with which you are connected?—Yes, in some, but not generally.

8954. Is the cost of it much, or sufficient to prevent its being generally adopted?—Next to nothing at all—a few pounds. It is a new idea, and it requires a long time to change an old course.

8955. Did you ever know them to load the safety valves?—Yes; it is the exception where they do not do it.

8956. Do they not very often load them with very odd things?—Yes, with anything they can find. The point is, if the steam is got up a little fast, and if the agent sees that the steam is blowing away, he wants to know why that is so, and sometimes the valve is kept down to prevent the steam from escaping.

8957. (*Chairman.*) Is it generally the case that the boilers are not sufficiently looked after?—Yes; there are some places where a great deal of care is taken about them, but that is the exception, and not the rule.

Capt. Joseph Vivian, of North Roskear.

9088. (*Chairman.*) Have you any rule as to your boilers being regularly examined?—I do not know that we have any regular rule; the boilers are tested occasionally.

9089. Have you ever had an explosion?—No; if the engineman does his duty properly it is impossible that an explosion can take place. The breaking out of a boiler is of little consequence, but the blowing up of a boiler is a very serious affair; and if the engineman sees that the feed is as it should be the boiler cannot explode. If the breaking out of a boiler happens we must patch it at once.

9090. Is the breaking out of a boiler a common thing?—It happens when the boiler gets old. The engineman says, such a boiler is getting leaky.

9091. When new mines are started are not many second and third hand boilers purchased?—Yes. The engineer has to examine them to see that the boilers are perfectly safe.

9092. Have you any water gauge to show the amount of water in the boiler?—Yes, always; the engineman can tell exactly where the water is.

9093. Without trying the cock?—Yes; he has his gauge; we work about six inches of water upon the tube, and he can tell if the water gets one inch below.

9094. Is that generally the case, in your opinion?—Yes.

9095. (*Mr. Holland.*) What sort of a gauge is it?—There is a swimmer gauge.

9096. Not a glass gauge?—No, we always depend upon the swimmer acting; many have glass gauges.

9097. (*Chairman.*) Have you more than one safety valve?—There is a safety valve for every boiler.

9098. Only one?—Yes, to each boiler; the boilers are connected, we do not depend upon one.

Capt. John Daw.

9276. (*Chairman.*) With respect to the boilers, have you ever had an explosion?—Yes, in several mines. We had an explosion of a boiler in Great South Tolgus, and also an explosion of a boiler in Huel Uny, and we have had two or three at Carn Brea. All the explosions that have come under my notice have been a regular collapse of the tube from one end of the boiler to the other.

9277. What do you think is the cause of that?—I do not know; it is generally thought that the water is below the back of the tube, but I have never seen anything like it before these last few years.

9278. Does this happen immediately on starting the engine?—No. We had an explosion at Great South Tolgus. I do not know whether the boiler was 5*l.* worse for wear than it was when it was brought out of the factory; it was a strong good boiler, and the plates were as good as when they were put in; and the boiler at Huel Uny was not in more than five or six weeks; it was not a new boiler, but it was thoroughly repaired, and it exploded. At Carn Brea we had one which exploded in about 12 months I think. The tube goes down as close as it can go; there is a collapse from one end of the boiler to the other.

9279. (*Mr. Holland.*) The internal tube?—Yes.

9280. Had the boiler been short of water?—I do not know that it had. There was something in Carn Brea last year; it happened at the time when the directors came on the mine; there were four boilers side by side, there were two on one side and one on the other of the one which exploded. I was standing off, and there were lots of people about; they wanted to know what the cause was. I actually looked up and saw that the steam was blowing away from pipe—it went through the roof. I said to the engineman, "Go and turn the gauge cock of the boiler;" he did so, and I found that the first boiler was flush. I followed him up with the others, and he turned the gauge cocks of the three boilers, and they were all flush of water, and in 20 minutes after the boiler exploded we were working the engine again. I never experienced anything like it before, because there were three boilers which were flush to the top-cock, and this boiler had exploded.

9281. (*Chairman.*) Were they connected with each other?—They were all connected one with another.

9282. (*Mr. Davey.*) What you have described took place after the explosion?—Yes, the safety valve was above and the weight of steam pressed it down. The engineman was frightened.

Capt. William Teague.

9389. (*Chairman.*) Have you had any boiler explosions?—No.

9390. Is your water pretty good?—No, it is bad water, generally speaking.

9391. How often do you examine your boilers?—Every month.

9392. Is that a regular thing?—Yes.

9393. Are the boilers then cleaned out?—Yes, they are cleaned out every month.

9394. Is there a regular record kept that they have been cleaned out?—No. The engineer of the mine goes into the boilers every month to see how they stand, or we expect him to do so.

9395. How does the water act on the boiler; does it corrode the plates evenly over?—No; we generally find that it gets between the space left over the water, and just on the rim of the water.

9396. Have you any means besides the stop cocks for the men ascertaining the quantity of water?—No.

9397. Have you more than one safety valve?—We have only one on some boilers, but we are adopting two on most of the boilers.

9398. Do you adopt any plan to prevent the man loading the safety valve?—No.

(E.)—ACCIDENTS.

i.) Bursting
Boilers.

Mr. John Richards.

9565. (*Chairman.*) With regard to the boilers, does the water that is used injure the boilers?—They are obliged to bring water there; we do not use the bottom water for the boilers at all.

9566. You bring the water to the boilers?—Yes; and we pay a rent for the water, we have an engine to pump that water up from a shallow level in order to send it all round the mine to the different engines; we have large wells there as reservoirs to receive it, and we take it out as we want it.

9567. Have you ever known a boiler burst?—Yes; only yesterday, I am sorry to say.

9568. Was anybody killed?—No; nor hurt.

9569. Do you know how that was occasioned?—I do not.

9570. Are the boilers examined regularly, or at any stated periods?—They are examined every month pretty regularly; we cleanse them, and they are examined all through.

9571. Is any record kept of such examination?—No.

9572. Was the engine at work when this accident occurred?—Yes.

9573. Had it been out of work?—Yes; the evening before it occurred they had cleansed this boiler, and they lighted a fire, and the boiler filled at four o'clock, and it worked on till midnight, and they stopped to change the bucket, went to work again, and they thought that they were working all right, and about seven in the morning off went the boiler.

9574. Have you any water-gauge?—We have a cock and a safety valve.

9575. But no water-gauge?—Not up.

9576. Do you test the quantity of water in the boiler by working the taps?—Yes; by working the cocks; we have two, one near about the level of the top of the tube, and another about three or four inches, which we call the working gauge.

9577. Is there more than one safety valve?—No; there is one to each boiler.

9578. You test the quantity of water in a boiler by the cocks?—Yes.

9579. Is there a float to the feed pipe?—No; we force the water in.

Mr. Joseph Jewell.

9681. (*Chairman.*) With regard to the boilers, is the water that is used not injurious to the boilers?—Our water is very good.

9682. How often are the boilers tested and cleansed out?—Once in three or four months.

9683. Is there any regular time for that to be done?—Yes; we generally do it every quarter, or every four months.

9684. Do you make any record of the time when the boilers were last cleaned out?—Not exactly. The working engineer of the mine sees to that, he sees that it is done properly. We keep a working engineer on the mines, and he goes from one mine to the other to see that these things are attended to.

Capt. James Pope.

9887. (*Chairman.*) Have your boilers never burst?—We had one boiler burst, but no accident occurred except the bursting of the boiler.

9888. How did that occur?—We could not ascertain how it occurred; we think that it was from the feed not being properly up, from there not being enough water in it.

9889. Have you any other means of ascertaining the quantity of water in the boiler except by the cocks?—No.

9890. Have you more than one safety valve?—We have two in some boilers, and only one in others.

9891. Can the men weight the safety valves as they like?—Yes.

9892. (*Mr. Holland.*) Do they do so?—We do not allow it, but it may be done.

Capt. Edward Richards.

10,360. (*Chairman.*) When had you a boiler accident?—I do not know the exact time, but I think about October last.

10,361. In the course of the last two years there were three other explosions?—Yes.

10,362. And you attribute that to the water, do you not?—Yes, the foulness of the water. I think that the last was from the neglect of the engineman; the man in charge. I think that two of them may be attributed to the man in charge; what we call the engineman.

(E. i.) Bursting
of Boilers.

10,363. Was not it from not attending to the stop-cocks?—Yes; to the gauge cock.

10,364. (*Mr. Holland.*) A neglect of the feed?—Yes, we thought so.

10,365. (*Chairman.*) Have you two gauge cocks?—Yes, to each boiler.

10,366. Have you any water indicator?—Yes.

10,367. (*Mr. Holland.*) A glass gauge?—Yes, inside.

10,368. To show the level of the water?—Yes.

10,369. (*Chairman.*) In the other case you think that the water had to do with the explosion?—I am not prepared to say; it was beat a good deal. This is a piece of the boiler plate (*producing the same*), which was deeply honey-combed, more than half of the metal being dissolved away in parts.

10,370. How long do you suppose that boiler had been in operation?—I am not prepared to say; but it will be like that in three months in some cases.

10,379. You have had the water analysed?—Yes; it was very impure.

10,380. (*Mr. Holland.*) What impurity was there?—The acid of copper.

10,381. Have you a copy of that analysis?—Yes.

10,382. Can you furnish us with it?—Yes, I think so.

Capt. William Chappell.

10,797. (*Chairman.*) Do you cleanse them out?—We cleanse them out every 12 weeks.

10,798. When a new mine is started are not second-hand boilers sometimes used?—Yes.

10,799. Do you consider that that is quite safe without a very careful examination of them?—No, I do not myself. If they have been in very bad water, I think that they ought to be looked very closely into; there are some exceptions where second-hand boilers would do.

10,800. Do you consider that the responsibility with reference to the boilers should rest with the captains and managers?—I think that it should rest principally with the engineers.

10,801. Should you as a manager inquire whether a boiler which was purchased by the adventurers of a mine of which you had charge was in a proper state?—Yes.

10,802. You consider it very important that a boiler before it is put up should be thoroughly tested?—Yes.

10,803. In your experience have you ever had to reject a boiler on account of its not being perfect?—Yes. Every boiler, either new or second-hand, should be properly tested by hydraulic pressure at the foundry by the agents of the mine or on the mine before it is put in use.

10,804. While the boilers are at work should you consider that at certain periods they should be tested?—In the cleansing of them, the person who is employed to test them after they are cleansed can examine them then without any pressure very well, and can see whether they have been eaten away. If there has been bad water, then they must be repaired before you use them.

10,805. Do you think that that would be a sufficient test to prevent boiler explosions?—Yes, if they are properly looked after.

10,806. Is it the business of the manager or captain to see that the boiler is in a proper condition?—It is the business of all, but that is more the engineer's department.

10,807. Have you a special engineer for the mine, besides the stoker?—Every mine has an engineer.

10,808. How often does the engineer inspect the boiler?—He comes about once a week.

10,809. But he can only test it when it is cleansed?—Yes.

10,810. Is notice sent to him before it is cleansed, so that he may be there when it is cleansed?—No. I do not think that that is a rule.

10,811. (*Mr. Holland.*) Is the engineer in the habit of going into the boiler himself?—No.

10,812. He trusts to the engineman?—Yes, the agents go in.

10,813. Regularly?—Yes.

(E.)—ACCIDENTS.

(E. i.) *Bursting of Boilers.*

10,814. (*Chairman.*) And it is their duty thoroughly to examine it?—Yes.

10,815. I suppose that you have heard of boiler explosions taking place?—Yes.

10,881. (*Mr. Davey.*) You have also stated that when a boiler is cleansed, by looking over it, and detecting any hole or anything of that sort, you prevent explosion. How do you account for explosions generally?—In some instances it is owing to the engineman being asleep; I suppose there is no doubt of that; and in some instances it is owing to the boilers being perhaps worked too long.

10,882. Do you think that a boiler would explode if the water was at a proper gauge?—I do not think that it would except there was a much higher pressure on it than it really would bear.

10,883. Have you ever found an instance where the engineman had put an extra weight upon the safety valve?—No, I have never found it with any that I have ever been connected with yet.

10,884. Might not that be a cause of explosion?—Yes, that would be a very likely way.

Mr. James Wearne.

10,978. (*Mr. Holland.*) Do you speak of the blowing up of the boilers as a real practical danger?—Yes.

10,979. Is it so frequent as that?—It is not very frequent, but I do not think that any person would be justified in recommending the miners to change in the boiler-house; the boilers are sometimes becoming weak. There was a case at Marazion the other day where a boiler was known to be weak, and it exploded, and I think killed two men. That is not the only case which I have known, and that is the reason why I should recommend the Commissioners to avoid looking upon that as a proper place for the men to dry their clothes in or to go in at all.

Mr. Thomas Gill.

11,101. (*Chairman.*) Are there fixed periods at which you inspect the boilers and clean them out?—We generally clean them out about once in twelve or six weeks.

11,102. Do you clean them out as often as that?—Yes.

11,103. Is the water that is used in them bad?—No, not very bad.

11,104. Do the boilers require to be cleaned out as often as you state?—Yes, every six weeks where the engine is working five or six strokes a minute.

11,105. It is necessary on account of the accumulation?—Yes, of the crust inside; and they are cleaned out so that it shall not get hard in the tubes. I have seen eight tons of stuff taken out of a boiler, the marks of the rivets and the tube being in the crust that has been taken out between the shell of the boiler and the tube.

11,106. Is any record kept of the periods at which your boilers are cleaned out?—No, I do not think there is, but the books will show that, because we are obliged to pay for cleansing.

11,107. With whom does it rest, with you or the engineer, to say when the boilers shall be cleaned out?—If the engineer says that such and such a boiler ought to be cleansed out, I tell him to do it at once.

11,108. Is it done on the report being made to you?—Yes, he generally reports it to me, and it is his place to look after them.

11,109. Have you any means of ascertaining the quantity of water in a boiler otherwise than by the stopcocks?—No.

11,110. Do you trust to the man who is in charge of the boilers to try those cocks?—Yes.

11,127. (*Mr. Holland.*) If a boiler becomes weak it would be dangerous?—Yes. I have seen them as thin as a sixpence, so that you might take and pick right through them, but they never leaked during the time they were in. I have examined boiler flues many times when we have taken them out, and they have not been thicker than a sixpence.

11,128. Would it not be a great advantage to have the boilers examined properly at short intervals?—I do not think it would be of great advantage.

Capt. John Hancock and Mr. Michael Morcom.

11,253. (*Chairman.*) Do you clean them at any stated period?—Yes; we clean about an average of three every month out of the nine, you may say three of boiler eight; as one of the whims is not employed much.

(E. i.) *Bursting of Boilers.*

11,254. (*Mr. Holland.*) So that they are cleaned about once in three months?—Yes.

11,255. (*Chairman.*) Is the water good?—It is very bad.

11,256. (*Mr. Holland.*) In what respect?—It is principally sulphuric acid.

11,257. (*Chairman.*) And it corrodes?—Yes, very badly.

11,258. And does the machinery suffer?—Yes; we use brass in most places where the water is acting powerfully upon it, where we can do it, and the gauge cocks are silver.

11,259. Is this water of the same character as that which you pump out of the mine?—Yes, that is the water which we have; we have no other water than what we pump out of the mine for every purpose, except rain water; we are careful to catch all we can, as it is much better for the machinery. If we have an iron air-pump bucket rod 3½ or 4 inches, it will not stand more than a week or a fortnight.

11,260. What has been your experience of the effect of the water on a chain which had been in the lift of the pumps for five weeks?—The links were entirely separated and were reduced more than one half of their size. It was destroyed by the sulphuric acid.

Capt. James Nicholas.

11,379. (*Chairman.*) Is the water bad for the boilers?—It is bad, but not so bad as it is in some mines; a boiler stands about 10 years.

11,380. How often do you clean them out?—About once in six months.

11,381. Whose business is it to examine the boilers?—That belongs to the engineer.

11,382. The captains have nothing to do with the boilers?—No.

11,383. In cleaning out the boilers, is there much sediment, or are they corroded by the water?—There is a sediment, and that of course comes from the corroding which eats out from the boilers.

11,384. How do you ascertain the quantity of water?—By stop cocks.

11,385. Have you more than one safety valve to your boiler?—Only one.

11,386. Is the strength of the boiler ever tested?—No, that is tested before it is brought into the mine.

Capt. John Prout Daw.

11,485. (*Chairman.*) Have you anything but stopcocks to ascertain the quantity of water?—We have glasses which indicate the quantity of water in the boiler.

11,486. Do you think that a good thing?—A very good improvement.

Capt. John Taylor.

11,581. (*Chairman.*) How do you test the quantity of water in the boiler?—By the cocks.

11,582. Have you any glass tube?—No.

11,583. Have you more than one safety valve to your boilers?—We have two.

11,584. Are they both in charge of the engineman?—Yes; we take care to have good careful enginemen, and we have never had any accident.

11,585. You have heard of accidents?—Yes, of course.

11,586. Do they constantly occur?—They very often occur.

11,587. In your opinion what do those accidents arise from?—Very often from the want of feed being kept in the boiler.

11,588. (*Mr. Kendall.*) You have worked in a great many mines, have you yourself known of any accident?—I have worked in several mines during my time.

11,589. (*Chairman.*) Have you ever known of any accident?—We have all heard of accidents.

11,590. Can you name any mine at which you have heard of any boiler accident occurring?—Yes, I can name them of course—several; I can name one that took place not more than six months ago, I suppose, in our neighbourhood; it was an accident by a boiler explosion at the Wheal Loval Mine; no one was killed; that was about six or seven months ago.

11,591. Do you know how that accident happened?—I cannot tell you how that happened, it is impossible to tell you that.

(E.)—ACCIDENTS.

Bursting Boilers.

Mr. John Bryant Wilkin.

11,638. (*Chairman.*) How often do you clean out the boilers?—Once a year.

11,639. Do you consider that that is sufficiently often?—Quite often enough.

11,640. Have there been any accidents with the boilers?—Never.

Mr. William Goddan.

12,127. (*Mr. Holland.*) Have you a gauge pipe to show the depth of water in the boiler?—No glass pipe, but two cocks.

12,128. Do you not think that a gauge pipe would be a good thing?—As long as the engineman minds the taps, it does very well

(E. i.) *Bursting of Boilers.*

12,129. Would it not be an improvement to have a glass water gauge?—It certainly would be an improvement.

Mr. Joseph Phillips Nicholls.

19,509. (*Chairman.*) Have you a boiler?—We have two boilers at Frank Mills, and one at South Exmouth

19,510. Are those boilers provided with any index?—One is, the others are not.

19,511. In the others, is it ascertained merely by the cocks?—By the cocks and the safety-valve.

(F.)—CHANGING HOUSES.

Changing

Mr. James Barkell.

853. (*Chairman.*) Where is that?—They change in the boiler-house.

854. There is no other place to change?—No.

856. Is there any danger from the boiler house blowing up?—We have no appearance of it? we do not know; the men have never expressed a fear, and I have no fear in going to the boilers. We have proper safety valves.

Mr. William Richards.

1022. (*Chairman,*) When the men ascend to the top, have you a changing house?—We have a changing place.

1023. Where is that?—It is in the boiler-house, by the side of the boiler.

1024. Would it not be better if there was a changing house as well?—I think so: but the probability is, that the men would prefer the present place. I am of that opinion because the temperature is warmer.

1025. Have you ever seen any changing houses which are heated?—I have.

1026. Do you think that is an advantage?—In some cases.

1027. I suppose that that is the case when there are a great number of men?—Yes; when the men are numerous I think it probable that they would prefer a little more room. We have only six men at a time.

Mr. Thomas Trevelyan.

1101. (*Chairman.*) Do they ever catch cold in coming up?—Not that I am aware of.

1102. You have a changing house?—Yes.

1103. Is that at the boiler, or is it separate?—We have a house distinct from the boiler house, which was built distinctly for them to change in; it is optional on their part; sometimes they prefer the boiler; we do not interfere with them. The quality of the boiler is very good, and consequently they venture to go there. When it is very warm they might go to another place.

1104. You say that "they venture to go there;" is there any danger?—There must be danger connected with it where there is steam, but we do not suppose that there is any great danger.

1105. But there is danger of the boiler bursting?—Of course there is no certainty at any time where there is high-pressure steam.

1110. (*Chairman.*) Then you think that it would always be safer to have a separate changing house?—Yes; we have one now; but the men will go to the boiler-house again.

1111. Is the changing house which you have heated at all?—No.

1112. It is not a drying place?—We have no fire put into that house: ours is a very dry mine; we have no water; the men are always dry, and by putting their clothes upon the boiler, and changing there, we find it quite sufficient.

1113. I suppose that when men come up very hot, and in cold weather, it would be an advantage that the changing house should be warmed or comfortable?—They are very close; where they come up the footway they are there immediately.

1114. The footways are close to the changing house?—Yes.

1115. You have more than one changing house?—Yes, we have another in the south part of the mine, where the men connected with the shaft change; we keep a fire there night and day, because the men working in the shaft require to dry their clothes.

(F.) *Changing Houses.*

1116. They get their clothes wet?—Yes. A house is especially set apart for themselves.

Mr. James Seccombe.

1475. (*Mr. Kendall.*) What do the men do with their clothes?—They hang them up all round the fire doors.

1476. You are of opinion that you ought to have a dry there?—Yes; and it is very likely that we shall have one as we get further on. I may say that we intend to have a dry.

1477. Ought you not to have a dry?—I think that our men now can change very comfortably, and we have never had an accident, although we cannot say that the thing might not occur, and therefore it is thought to have a dry. We have a stack put off a certain distance from the boiler-house, to put a dry there. In going down through this mine I have to consider whether we shall have a place between the boiler-house and the stack for the sake of a dry.

1478. What does a good dry cost?—Not much.

1479. About how much?—Not above 100*l.* for a mine of the size of ours

1480. What would it cost to keep it at work?—Perhaps not 10*l.* a month.

Mr. John Sampson.

2069. (*Chairman.*) In the Fowey Consols is there any dry?—We used then to dry our clothes at the blacksmith's shop, that was some 16 years ago; I cannot tell anything about that now.

2070. Did the men catch cold?—Yes, I believe that the men caught cold by sitting in the footways more than anything else. That is tutwork men. The tributers would also catch cold, because they had miserable places to change in at Fowey Consols while I was there, they had miserable little barracks. I do not know whether it has been altered since I came away

2071. But it is desirable that there should be a warm place?—Yes, I should think so; that it would be a good deal better for men if, instead of sticking about in the footway, they could get up and have a warm comfortable place to change their clothes in

2072. But why are they standing in the footway?—If they come above and meet the captain at the head, and should happen to be up before time, the captain will spale them 2*s.* 6*d.*

Mr. Peter Clymo.

2218. (*Chairman.*) They have a changing house, I think?—Yes.

2219. Do you think that that is a very great comfort to the men?—A very great comfort.

2220. It is appreciated by them?—Very much.

2221. Do you think that it is calculated to be an advantage to their health?—There is no question about it.

2222. Will you describe it?—What they have now is very different from what they used to have many years ago; there was nothing of the kind: there was no dry or anything of the sort; there was a house in which the men used to change, and there was no fire, or anything of the kind; and, in fact, in many places there were not even windows. I have seen myself many times a long house where there were places for windows, but not even a window or a door hung, so that a strong wind must be going through; but now, in mines of any magnitude, the whole of them have dries, whereby the men's underground clothes are dried and made comfortable for them against they come to their different corpe; and also, if they should happen to get wet in going to the mine, their walking clothes are dried for them against they come up.

2223. Are the clothes which they come in, if they get wet, ever dried?—Yes.

2224. To your knowledge are there many as good drying houses as the one which you have put up at South Caradon?—There are drying houses, but I do not know whether they are generally so good.

2225. You have also, I believe, warm water for them to wash in?—We have. It is condensing water brought from the engine, and it is close by the dry.

2226. The dry is sufficient accommodation for the 400 men?—Yes; we have two there.

2227. About what was the cost of putting up that dry?—I should say that in the largest which we have put up there, the last one, the slate and altogether was expensive, and I should think that it cost 100*l*.

2228. But you think that for the comfort of the men it is money well expended?—There is no doubt about it.

A Miner, No. 2.

2910. (*Mr. A. Bruce.*) Have you ever worked in a mine where there was no warm place to dry your wet clothes, and in which you could change your clothes?—Yes.

2911. What was the effect of working in such a place?—I often caught cold, and so on. At South Caradon, about some ten years ago there was no dry at all. It is true that when we came up with our clothes wet, we were allowed to carry them down to the blacksmith's shop, and hang them over the forge which had been working during the day, and it was naturally warm; and if our clothes were dry, well and good, but if not, we must put them up as they were.

2912. That very much increased the risk of ill-health?—Quite so.

A Miner, No. 3.

2986. (*Mr. A. Bruce.*) Have you ever been in a place where there was none?—Yes.

2987. Where?—Over at South Caradon; that is years ago; they have now better convenience there than they had then.

2988. Did you change your clothes when you came out?—Yes. When I have gone to mine I have gone over there in the afternoon in cold weather when there has been a little rain, and I have come up and put on my clothes when they have been frozen, at 10 o'clock, and my trowsers would stand up as stiff as a stick.

2989. That is to say, they were wet and were not dried, and they froze?—Yes; that is years back.

2990. Do you think that a man would do that often without some bad consequences?—No; I feel the pains of it to this day.

2991. There is not much of that now, is there?—No, I believe not. I do not work there now.

Mr. Christopher Childs.

3119. (*Chairman.*) Are good changing-houses the exception?—Changing-houses are the exception; there are some "dries," as they are called, which have been very recently put up in this neighbourhood; they are now being lengthened, and I hope that they will also be further improved. The dry itself does not, I should say, afford a man a decent place for the change of his clothes.

3120. Have any changes houses been put up on the representation of Lords?—I have known where an improvement has taken place; but still it is an imperfect one. The dry is there, and the miner may change in the dry or go to his barracks.

Mr. Andrew Kingston.

3307. (*Chairman.*) Have you ever visited any of the changing houses?—Yes.

3308. Are they warm and comfortable?—Those that I have been in have been warm.

3309. Do the men experience any inconvenience or injury to health from the amount of dust in those changing houses?—I think that where there is plenty of dust it is a disadvantage to them.

3310. If they change where the clothes are dried are they liable to be subjected to much dust?—Yes. Dust comes off their clothes. I do not think that they would feel it much if they were all right otherwise.

3311. But being somewhat affected, as you say, that would tend to increase the inconvenience?—Yes; it would tend to irritate their chest.

Mr. William Wale Tayler.

3695. (*Chairman.*) Do you consider that the nature of the changing house has at all to do with the health of the men?—No, I do not think that it has.

3696. You do not think that in changing where it is open and exposed to the weather, it would be liable to give them cold?—It would if it were open and exposed to the weather. I have seen the changing house at Par Consols; I do not think that that is open to the weather.

3697. Supposing that there was a changing house where the roof was very low, where instead of windows there was nothing but openings, where it was exposed to the draught, and where it was badly ventilated, would it, in your opinion, be likely to affect the health of the men?—I should think that it would certainly be likely to give them cold.

Mr. John Pearce.

4082. (*Chairman.*) Is the changing house generally near the engine shaft?—Yes, but it is not at all mines that they have a changing house. It is more generally adopted now than it was formerly; they used to change on the boilers.

4083. Do you think that is a good system?—No; there is plenty of dust there, and the steam is blowing out, and there is the danger too, although it very rarely occurs, of an explosion.

4084. Therefore it is desirable to have a changing house?—Yes.

4085. Do you think that the changing house should be the same as the drying house where there is a good deal of dust?—It would be the better course, but we must look in some degree to the building of these places. There is no question that it is far better for a man to breathe the clear atmosphere than where there is plenty of dust.

4086. Therefore it is essential to the man's health in some degree that there should be warm and convenient changing houses?—Yes, I think that they are very likely to be a great benefit to the miners.

Mr. Francis Puckie.

4947. (*Chairman.*) How many changing houses have you at Fowey Consols?—I suppose that we have got three regular changing houses; but I think the men change in more than 20 houses.

4948. You say that you have three regular changing houses; will you describe to the Commissioners what those are; in the first place, is there a fire kept in them?—We have got in some of them a warm iron tube that goes from a place that we keep always heated to dry their clothes, and to warm the room; every man can change there if he likes, but there are some who would rather change off from those places.

4949. How high are those changing places?—As high as this room.

4950. Are the walls of the changing houses at Fowey Consols as high as those in this room?—Perhaps not quite so high.

4951. Are they six feet high?—Yes.

4952. Are they eight feet high?—More than 10 feet high, I should think, some of them; some of them are not quite so high, some are not more than six.

4953. Is there glass in the roof, or how are they lighted?—They are generally lighted by the doors and windows; in some places we have glass lights, and in some places only wooden shutters.

4954. Where there are wooden shutters there would be no light, except by opening the shutters?—Not in some of them, and the doors.

4955. In such a place as that would not the men have to change in a draught?—No.

4956. Do the men never complain?—No I have very seldom heard any complaint against them. I believe that the men are generally very well satisfied with the changing places, and with the drying of their clothes, and everything of that kind.

(F.)—CHANGING HOUSES.

(F.) Changing Houses.

4957. Do you not think that it would be an advantage to have a changing house near the footway?—Ours are not very far from it; it is impossible that you can get them near the footway everywhere without great inconvenience. In mines where they have not the advantage of a man engine of course they have to come up a great distance from the different parts of the mine; in Fowey Consols the men in the mine do not go up and down by the man engine, it is not so far down for them to go underground, they would rather take the ladders in shallow levels; perhaps they would change in the places that were first erected for them, instead of going to the regular changing houses. In Par Consols, in the western part of the mine, we have no man engine, we have different footways and different shafts.

4958. Do the men change in the nearest changing-house to the footway?—Yes.

4959. I suppose they do not like to go on a cold wet day a long distance?—No.

4960. Those men who come up by the ladders, come up, do they not, much hotter than those who come up by the man engine?—Yes, very much so

4961. Do they never catch cold from changing their clothes in a changing house without windows?—I do not think that they do, they are there only a few minutes, and they are gone.

4962. They have to change their clothes?—Yes, they must do that.

4963. Do they wash themselves when they come up?—Yes, almost every one of them.

4964. Where is that done?—Generally in all our changing houses we have the means of bringing the condensing water, which is warm for them, so that they all have the advantage of that.

4965. Do they have the advantage of that in all of them?—No, not in the little ones, but in the principal changing houses they get it.

4966. Is there not a great deal of dust flying about when they change their clothes?—There is sometimes more dust than there need be, because they will get playing one with another, and get throwing about their clothes.

4967. Still their clothes are full of dust, are they not?—Yes.

4968. How many men would change their clothes in one house?—Perhaps we might have 200.

4969. All of them changing in one house?—Yes; but not at one time.

4970. How many should you say would be changing their clothes at one time?—Sometimes as many as 50.

4971. Fifty men changing their dusty clothes would create a good deal of dust, would they not?—Yes, they would sometimes; generally before they go to change, if the clothes are dusty from working in a dirty place, they will go out and clean their clothes before they change them.

4972. But if it were raining they could not do that?—They generally do that; they give them a good shaking, and some of them will take a stick and beat their clothes with it.

4981. Are all the men's clothes dried in those drying houses, or are any dried on the boiler?—Men are kept there night and day to dry their clothes.

4982. Do they dry their clothes as they come in?—Yes, they are all hung up. A miner will say to the man looking after them, "I shall be glad if you will dry my clothes," and he does so.

4983. Is it his duty to do so unless he is asked?—Yes; but of course he does not know which is wet and which is dry unless he is told of it.

Mr. Richard Quiller Couch.

6455. (*Mr. Kendall.*) Does that bad health, on the part of the miners, in your opinion, arise from simple causes or from complicated ones?—I believe that there are several causes to which it is to be attributed, but chiefly to bad ventilation.

6457. And perhaps also the want of drys?—Yes; the want of drys at the surface.

Capt. Richard Boyns.

6867. (*Chairman.*) In the different changing houses which you have, is the accommodation for the men good?—We have put up a dry in the last three or four months for 60 or 70 men; they change in the boiler-house in some instances.

6868. Do you approve of that?—No; and yet it is a nice place for drying their clothes. The powder is kept outside under sheds. I do not think that the boiler-house is the place for men to change.

(F.) *Changing Houses.*

Mr. Henry Boyns.

7348. (*Chairman.*) Have you got a good changing house?—We have them warm; but I do not think that our condition is altogether satisfactory on that point. We change in the boiler houses; the engines being in different parts of the mine make it very convenient for the men, being near the shafts and warm to dry their clothes. I think it is preferable in some cases, but I think we should have a little better arrangement than that as a rule. I apprehend that there must be danger, although we have had only one accident from the bursting of a boiler in the neighbourhood.

Mr John Nancarrow.

8522. (*Chairman.*) Do the men change in the boiler house?—No, all the men in the mine are collected in the dry.

Capt. Charles Thomas.

8822. (*Chairman.*) And that the men should also have a place near the footway to change their clothes in?—Yes, it is a great advantage. At Cook's Kitchen it is exactly the same, and at West Seton. We have 800 persons working at the surface at Dalcoath Mine, and 300 at Cook's Kitchen, and 300 at West Seton; and one advantage is, after the dinner hour is closed, upon the ringing of the bell, the captain is there to see that every one is out to their work again in a minute; and but for such an establishment as that they would be scattered all over the mine in a great variety of places, and it would take a quarter of an hour to get them to their work again.

Capt. Thomas Richards.

8958. (*Chairman.*) I believe that in many of the mines in the county the men change their clothes in the boiler-house?—That is getting done away with now to a great extent.

8959. Is not that a dangerous practice?—Yes; and it is improper in every way, both for their health, and in all ways it is improper.

Capt. William Teague.

9404. (*Chairman.*) Do your men change in the boiler-house?—No.

9405. You have dries and changing houses for them?—Yes.

Capt. William Chappell.

10,816. (*Chairman.*) Do you consider it dangerous for the men to change in the boiler-house?—Yes, in the case of old ones.

Mr. James Wearne.

10,973. (*Chairman.*) You have stated that you think it unwholesome after coming up to go into some of the dries when they are hot; is there much dust in the dry?—I think that it must be a little dusty, because as the clothes dry the dust gets into the air.

10,974. Therefore it would be better if the clothes were dried in another place?—Yes; and if there was a warm place for the men.

10,975. You think it advisable to have a warm place for the men?—Yes, of a certain temperature; but not, generally speaking, the same as that of the dry.

10,976. And you think that that should be in all the footways?—Yes. I presume that whenever a man is made uncomfortable by change of temperature, or any other cause, it is likely to injure him. I think that the miners would prefer it; and it is always the interest of the adventurers to make the men healthy and comfortable, and to keep them up.

10,977. You would not recommend their changing in the boiler-house?—No, that is very hot, and we have seen very melancholy accidents happen; a boiler bursts and the men are blown to pieces; you could not recommend it officially.

Mr. Thomas Gill.

11,117. (*Chairman.*) Do you think it is dangerous for the men to change in the boiler-house?—I should not

(F.)—CHANGING HOUSES.

(F.) *Changing Houses.*

like to see a large number of men go to change there, for, should the boiler burst, it would be almost certain death to them.

Capt. John Burgan.

11,178. (*Chairman.*) Have there been any accidents with the boilers?—Not one. I think that there is nothing we ought to be more particular about than the safety of our men

11,179. Do the men change their clothes in the boiler-house?—Yes

11,180. Do you think that is a prudent thing?—No; I do not think it is.

11,181. Do you think it is a bad thing?—I think that they ought to have better means.

11,182. You would, I presume, recommend your adventurers to provide a changing house?—Yes.

Mr. Joseph Matthews.

18,911. (*Chairman.*) With regard to the surface accommodation, the changing houses, and so on, has there been much improvement in that way since you recollect?—Very much. In the first place, in all our mines we have dries, where the men's clothes are always dried for them before they go underground, and where, if they take off their wet clothes, they are dry by the time they come from underground; and that, no doubt, would very much conduce to their health.

Mr. James Hosking.

19,092. (*Chairman.*) Where do the men change on coming up from the mine?—In the dry. We have a tube, about five feet in diameter, from the engine house, always warm. The smoke which comes off from our two boilers pass through this tube, and it always causes it to be warm, so that sometimes a man cannot suffer his hand on it. They dry their clothes, and there is a man to attend to that.

Nathaniel John Haydon, Esq., M.D., L.R.C.P.

(F.) *Changing Houses.*

19,550. (*Chairman.*) What, in your opinion, is the principal cause of this?—The want of a good changing house and proper "dry," so that the men have often to change while their clothes are still wet.

19,551. Do the men not change in the boiler-house?—No; they are allowed to dry their clothes there, but not to change.

19,552. Why?—Because the captain considers it dangerous; the steam engine does not work regularly, but only at certain parts of the year when water power is scarce.

19,553. Have you many men at one time under your care?—Yes; particularly in wet weather. I have had as many as six or seven out of the 45 at work there.

19,554. From what disease?—From colds and from the diseases I before mentioned.

19,555. Do the men complain?—Yes, they complain of the want of a good "dry" and "change." Most of them have to walk from Bovey to the mine, just 2 miles, over an exposed road; they frequently get wet through; they then go underground for 8 hours, come up fatigued and freely perspiring, and have to put on their wet and cold clothes.

19,556. This, then, would be likely to induce sickness?—Certainly; for a man exhausted by 8 hours' work underground would be more liable to feel the ill effect of cold and wet than a man not exhausted; he would, therefore, be so much the more liable to "catch cold."

19,558. How many men did you say there were at Atlas Mine?—From 40 to 50.

19,559. What description of ore is raised there?—Tin

19,560. Is the mine well ventilated?—I have never been below, but I produce a section of the mine. She is said to be very well ventilated.

19,561. Are the men healthy?—Yes, very healthy

19,562. What do you attribute this to?—To a good changing house and "dry" near the shaft.

19,563. How long have you had the medical superintendence of these mines?—About four years.

(G.)—WAGES AND DEDUCTIONS.

Mr. Thomas Trevelyan

(G.) *Wages, &c.*

1160. (*Chairman.*) You give higher pay than the agricultural labourers receive in the neighbourhood?—Yes.

1161. What is the pay of a surface man, generally?—2*s.* a day.

1162. What do the pit workmen earn generally?—Our men strike on an average about 3*l.* 12*s.* 0*d.* per month.

1264. Can you state to the Commissioners the lowest rate at which the men work for any set?—Perhaps a man might work a month for 50*s.*; he might do so; and sometimes as agents we advance a trifle to him, rather than send the man home; that is to say, we would rather lend him a few shillings, and when he does well take it back again. For example, a man with a large family. We do not like to be hard-hearted to him.

1265. That is money to assist him?—Yes.

1266. That would be in a case, I suppose, where a man had made a bad bargain; for example, when the end has turned out harder to work than he expected?—Yes.

1267. So that sometimes a man in taking a set or bargain finds that he does not earn 50*s.* a month?—They might work for 1*l.*, probably. The bargain might turn out badly, and a man might not earn 1*l.*; it is possible

1268. In that case would you advance the man money?—It is optional whether we will do so or not; we are not bound to do so; but some men are more humane than others; some men would, and some would not

1269. Otherwise a man might not earn 1*l.* a month?—That is so.

1270. And that depending upon the nature of the ground?—Yes.

Mr. James Seccombe

1406. (*Chairman.*) With regard to tut-work, the pay is less fluctuating, is it not?—Yes, they have not got to calculate so much, but I think if there were different modes in the setting of tribute we should get more men that would know well enough about tribute, only that the tribute pay is not so quick as the tut-work pay, but my late brother and another person whom I knew considered it a very good plan that they should give the tributor a fixed standard, and then they could pay him as quick as they could at tut-work bargain, for when they got a sample they would know then the quantity likely to be produced, and what portion they must pay him for his produce.

(G.) *Wages, &c.*

1407. And that system you think would be better for the men?—Yes. I think that they should not have the standard to speculate with at all, but only the quality of the lode, and the easiness or hardness of the ground, and so they would know how quick a certain piece of ground could be worked out; but that must depend upon the country.

1408. And upon the agent?—Yes; the captain and the men

1409. In many cases the tribute men, I believe, are often without pay for some time?—Yes; and they are allowed subsist, perhaps a couple of pounds, just to provide them with a little living before the balance comes. Sometimes they are working for five or six months before they settle up, and a great many of them do not like that.

1413. What do you allow them to get?—Perhaps 3*l.* 10*s.* the better men; the shaft man about 4*l.*

1414. That is for sinking down a shaft?—Yes, or driving our bottom level; they have a little more trouble than others with the water.

1415. And therefore they earn more money, which they draw?—Yes; they are worth about 10*s.* a month more.

1521. Have there been any accidents from blasting?—Yes; there is one man that we have been paying to, I should think, for ten or a dozen years. He is a young man, and he receives one shilling a day from the fund. It is called the fund; but I do not call it their fund at all, because every man, when he comes to know the

Wages, &c. charge, will look to the balance he has to take up. He sees what is to be deducted. It is nothing but a form. There is the doctor and the club, and it is deducted, and he sees the balance. The men always look to the money that they have to carry away from the mine.

1522. But there are other deductions, are there not; for example, for candles and powder?—Yes; for sharpening tools, and short weight. Those are deductions, and when the bargain is measured, his ground is made up to see what charge is made, and all those deductions come in.

A Miner.

1964. (*Mr Davey.*) What wages did you get whilst you were there?—Perhaps from 3*l.* to 3*l.* 5*s.* or 3*l.* 10*s.*

Mr. Peter Clymo.

2352. (*Mr. Kendall.*) What are the average gettings in your mine?—You must keep the tutmen separate from the others, if you put the tributers with them it throws the average up considerably.

2353. But in the district what are the average gettings of the tutmen?—In the district they are from 3*l.* 5*s.* to 3*l.* 10*s.*

2354. What do the tributers get?—They get more, for instance, if one should get what is termed a start, they may get, perhaps, 40*l.* or 50*l.* in a month, and that throws the average up considerably on the whole.

2451. (*Chairman.*) What should you say was the least?—Some of them, if the ground is against them, will not make perhaps more than 2*l.* a month, and even less than that sometimes in bad ground. You set to a pair of men and you give them 4*l.* a fathom, and, before they have half driven six feet of ground, the ground will become such that they ought to have 7*l.* or 8*l.* a fathom; then those men are thrown back, and sometimes men will drop their tools, and run away and leave it. But we are never in the habit of taking out a bargain of that sort, because if the ground goes the other way we never attempt to keep back anything; we pay them what they earn, and we take the bad with the good.

2452. If it is bad they do not get any more, although it is a bad bargain?—Instead of 3*l.* 10*s.* they would not get more than 2*l.* or 30*s.* If they are steady men we charge them with what they call subsist; we advance a sum of money on the month then out—for instance, if you are going to pay next Saturday, you would pay for the work done in March month, then you would have a month in hand, and we should advance them a little money to take it up, perhaps 10*s.* a man, or 1*l.* upon the month after, to enable them to purchase provisions for their families.

Mr. Robert Dunstan.

3577. (*Chairman.*) Do you consider that the miners do suffer in their health generally?—Yes, and they are badly paid too as a body.

3578. Are the miners badly paid?—Yes, as a body they are.

Capt. Stephen H. James.

7569. (*Mr. Davey.*) You say that the average gettings of your men are about 3*l.* 5*s.* a month?—Yes; our wages were over that amount on the last pay.

7570. That is beyond what they get in the midland part of the county?—I am sure it is. Tut work and tribute work are very much the same; sometimes they vary; sometimes one will do better than the other either way, but taking them as a whole I is think the average is what I have stated.

Capt. Charles Thomas.

8788. (*Mr. Holland.*) Do you charge the men so much for the barber?—Yes; 3*d.* a man, and I would strike that off if I could. I tried to do it seven years ago, but I did not succeed.

Capt. Joseph Vivian, North Roskear.

9042. (*Chairman.*) And the fees of the school are paid by whom?—By the mine.

9043. At what per head?—We pay I believe at present more to the school than we have children there. A penny a week is our pay for each child.

9044. Is there any charge on the miners for the support of the school?—A great part of it is from the miners. There is a club, but the club in reality is provided by the adventurers. It is considered as a part of (G.) Wages, &c. their cost of materials, and so on, although it is deducted from the men. There are many things that we deduct from the men to make them as economical as we can, but they do not really pay for it.

9081. (*Chairman.*) Taking an average of the men's earnings, it does not give you any idea of what is really earned by the different tutwork men and tribute men. The average does not give you the real amount earned by the separate men?—No.

9082. Some men therefore are well off, and some men are not well off?—Precisely so; and more particularly so with the tributers. Some of them get a great deal of money, and others are speculating; a pitch turns out badly and they do badly.

Mr. Robert Hart Pike.

9171. (*Chairman.*) Is the rate of wages less in St. Agnes?—Yes; there is more competition; there are more labourers in proportion to the labour.

9172. You think that that is the reason?—Yes, decidedly. I remember the time when you would have to pay more at St. Agnes than you would pay here, because for some time previous the mines had been poor, and very few men had been employed, and consequently they had to migrate from the place, and afterwards when the mines were again put on there was a difficulty in getting men, and men had to be brought from here to work the mines in St. Agnes. Now the population there has increased, and there are more men than are required, and they prefer remaining at home where they have a house or a family and working at lower wages to coming away and getting more.

9173. Therefore it prevents the earnings over Cornwall being equalized?—Yes.

Mr. John Richards.

9562. (*Chairman.*) But a miner may get less than that?—Yes, I should think that the average gettings are 3*l.* 10*s.* a month.

9563. Some earn more and some less?—Yes; where they are able men they are pretty regular.

9564. Are there more men who get more than that than those who get less than that?—There are more who get less than that.

Capt. James Pope.

9918. (*Chairman.*) Have you any charge for the barber in your mine?—Yes.

9919. How much?—3*d.* per man per month.

9920. Do the surface men pay that?—Yes.

9921. And the underground men?—Yes.

9922. (*Mr. Holland.*) How old are they when they begin to pay?—As soon as they become established as men; some as low as 15 or 16.

9923. Although they have no beard?—Yes; although they have no beard they pay sometimes.

9924. (*Chairman.*) As soon as they take a man's share of work they pay?—Yes.

Capt. John Michell.

10,083. (*Chairman.*) Do those whom you have now earn enough to live well?—Yes; they average I should think about 3*l.* a month.

10,084. I suppose that there are a great many who do not earn that?—A good many do not earn more than about 50*s.* or 55*s.*; but a good many earn 3*l.* 10*s.* and 3*l.* 15*s.*

10,098. (*Mr. Kendall.*) Did you ever know them cut it down to a halfpenny a month?—Yes, and to nothing. I have myself taken a pitch for ten weeks for nothing.

George Smith, Esq., LL.D.

10,355. (*Mr St. Aubyn.*) In the average wages are tributors and tutwork men included?—When people talk about an average, they should explain their own terms. I have sometimes great jealousy about averages. I do not know what is included in them.

10,356. You would not take that as a guide as to the earnings of the men?—If any one told me that the men in a certain mine averaged so much, it would go for nothing with me, unless I saw how it was made up.

(G.)—WAGES AND DEDUCTIONS.

(G.) *Wages, &c.*

Capt. Joseph Vivian, Huel Fortune.

10,719. (*Chairman.*) Do you charge for the barber? —We do.

10,720. How much?—3*d.* a month.

Capt. John Hancock and Mr. Michael Morcom.

11,326. (*Mr. Holland.*) Is that quite just?—Yes; I should say quite, for this reason, I consider that the adventurers are really that out of pocket; the adventurers pay it. In employing the men you do not really deduct the doctor and club out of their money. They must have a certain sum to take home to maintain their families, and we should screw them a little tighter so as to save the amount of the club money.

11,327. Is there any complaint of it by the men?—None at all. In fact I have not heard a single complaint by our men; they do not know the state of the club at all. If we had to pay them double what we keep back from them they would get the money.

Capt. John Taylor.

11,553. (*Chairman.*) How much is charged for the barber?—I believe it is 2*d.*

11,554. Do the surface men pay the barber as well as the underground men?—Yes.

11,555. At what age do they begin to pay for the barber?—Those who receive 30*s.* a month; after that I think we charge the barber to them.

11,573. Are the men charged with the expense of the cartridge?—The mine has to provide them. The men are certainly charged, but then the mine must supply the men with them in the first place, and the men must get their living whatever materials they use.

Mr. Joseph Matthews.

18,895. (*Chairman.*) How often is the pay of the men? —Twice a month; we have subsist and pay.

18,897. (*Mr. Holland.*) Then they can divide their money without going to a publichouse?—Yes. We always pay in such a way, that if we pay to four men 10*l.*, we give them 2*l.* or 3*l.* of silver, so that they can divide their money without going out of the mine.

18,898. (*Mr. Kendall.*) You have generally acted as purser of a mine?—Yes.

(G. *a.*) *Tut-workmen.*

(*a.*) TUTWORKMAN.

Mr. John Nankervis.

7234. (*Chairman.*) Does the man pay the boy, or do you pay him?—If it is tribute work, the man will pay the boy; but very likely if there is a piece of work, and we set it cheap, we provide a boy to keep the air right.

Capt. Charles Thomas.

8738. (*Chairman.*) Are the tributors and the tutwork men bound to see that those levels are cleared out, or how is that done?—They are under an obligation to do so; sometimes we are obliged to say to a pair of tributers, "Here is this stuff lying about here, and you must remove it before we come again."

Mr. Robert Hart Pike.

9214. (*Chairman.*) Should you be ready to pay tutwork men once a fortnight?—I should not hesitate about it at all: I think that it might be brought about. I think that it would be better if the surface men and women especially were paid once a fortnight.

Capt. J. Michell.

10,106. (*Chairman.*) Tutwork men have steady earnings?—Much more steady than tributers; but there is a good deal of difference there; when you set a bargain, you set a price according to what you think they ought to have a fathom, or what they ought to drive in one month. If they do not work, or the ground proves unfavourable, of course they do not get so much as you calculate upon, but nine times out of ten they get their 3*l.* or 3 guineas a month.

(G. *b.*) *Tributers.*

(*b.*) TRIBUTER.

Mr. David Buzza.

1668. (*Chairman.*) Does it answer your purpose better?—It is not so bad for the air on tribute as it is on tutwork.

1669. Is that one of your reasons for preferring tribute?—Yes, with the advantage, perhaps, of getting a trifle more money at times. But what I have come here for this afternoon is this: I worked in a mine called Devon Great Consols, and my family is now residing at . I have quarters here. I have been turned away, after I had done very badly for some months; 14 months; all that I earned during 14 months was 15*l.* 1*s.* 4*d.*

(G. *b.*) *Tributers.*

Mr. Robert Dunstan.

3466. (*Mr. Austin Bruce.*) Do you think that the majority of the men working at tribute-work are working under as good conditions, with regard to their health, as might be desired?—Yes, as far as the air is concerned and ventilation.

Mr. Francis Barratt.

4671. (*Mr. Kendall.*) Do not the tributers at times overwork themselves?—Yes, they do.

4672. For instance, suppose a man takes a pitch at 10*s.* in the pound, does it not frequently happen before the pitch is out that he finds he could work it very well at 2*s.* in the pound?—Yes.

4673. If his time is short, unless he can have any other help, does he not frequently work 16 hours instead of 8?—Yes.

4674. They work like slaves, do they not, during 16 hours?—Yes.

4675. Did you ever know a case in which a man who had got a start did not work like a slave, or at all events work very hard?—I think not.

4676. And in most cases much harder than he ought to work?—Yes.

4677. And much to the detriment of his frame?—Yes.

4678. Does not that, in your opinion, tell much against the average life of a miner as compared with an agricultural labourer?—Yes, no doubt of it.

4679. Now take the converse of that. Suppose that a man has got a fair price and the pitch fails, according to your experience, does he then work harder to make up for it?—No.

4680. He gets disheartened, does he not?—Yes.

4681. And it is quite the reverse of the other case?—Yes.

4682. He often does not work at all?—It is the hope of reward that sweetens labour.

4683. Is not this the fact that if a pitch turns out better than the miner expects, and he earns more wages, that he labours much more than he ought to do; and if it turns out worse than he expects he gets disheartened, and he works less than if it proves to be a good pitch? —Yes, just so.

Capt. John Webb.

5358. (*Mr. F. Egerton.*) The miners' lives you consider are shortened?—I have no doubt of it. That has come under my observation. I have observed it very particularly. I have seen the lives and health of the tributers much better than of the tut-work men, because the tut-work men are driving on to the extreme points to a winze or shaft, perhaps. Then when that is done, the tributors come in and explore the ore above that level, and a current of air is kept up there; consequently, the lives and healths of the tributers, it has been ascertained, are much better than those of the tut-work men.

Mr. John Mankervis.

7234. (*Chairman.*) Does the man pay the boy, or do you pay him?—If it is tribute work, the man will pay the boy; but very likely, if there is a piece of work, and we set it cheap, we provide a boy to keep the air right.

Capt. R. James.

8460. Did you ever get any start at all in any of the mines?—Not very heavy ones; sometimes 20*l.* or 30*l.*

8461. Have you known many men who have got starts?—Yes.

8462. When they get a start, is permission given to them to work as many hours as they like?—Yes.

8463. And I suppose they do work very hard at those times?—Yes.

(G.)—WAGES AND DEDUCTIONS.

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8464. How many hours do they work upon those occasions?—Very often 12 hours, not often less than 12 hours.

8465. When they get a start, do they not over exert themselves?—Some men do; most men do, I suppose; but they take in a great deal of eating and drinking to keep it up.

8466. Have you ever known a case in which their food and drink have been taken down to them, and the miners have stayed underground?—Yes.

8467. (*Mr. Holland.*) Have they stayed underground for a whole week?—No, only for 12 hours, and some refreshment has been taken down to them in the shape of beer and spirits.

Capt. **Charles Thomas.**

8738. (*Chairman.*) Are the tributers and the tutwork men bound to see that those levels are cleared out, or how is that done?—They are under an obligation to do so; sometimes we are obliged to say to a pair of tributers, "Here is this stuff lying about here, and you must remove it before we come again."

Capt. **Joseph Vivian**, North Roskear.

9074. (*Chairman.*) A tributer who has to exist on subsist with a large family, probably gets into debt in those four or five months?—We have a man now at North Roskear, a first-rate old man, who has been working there for 30 years; the last two years he has always been speculating, and has done badly. I said to him the other day, "You are doing badly." "Yes," said he, "I never had such a long run before, but I shall "make it up again soon." I said, "You have not "done badly upon the whole; you have been here from "a boy." He is worth 200*l.* or 300*l.* probably; he has one or two cottages, and keeps a cow, and so on; we never let him go upon less than 2*l.* 5*s.* a mouth, though for a long time he has not earned any money.

George Smith, Esq., LLD.

10,350. (*Chairman.*) A tutwork man has not the same chance as a tributer?—He has no chance of these starts.

10,351. (*Mr. Kendall.*) Latterly, in consequence of these starts, the mine agents have become more cautious, and they set the men to stope, instead of tribute?—Yes

10,352. (*Mr. St. Aubyn.*) What do you suppose is the number of working miners now living in Camborne, at a rough estimation?—I can scarcely say. There are 800 labouring men who have cottages, and by far the greater number of them are miners.

Mr. **Thomas Gill.**

11,098. (*Chairman.*) Do you pay subsist?—No.

c.) *Bal*

(*c.*)—BAL BILLS.

Mr. **James Richards.**

18,778. (*Chairman.*) What other items appear in the bal bill?—Smith-cost and powder cans, and the safety fuse.

d.) *Month*

(*d.*)—MONTH IN HAND.

Mr. **Peter Clymo.**

2454. (*Chairman.*) What is the reason of that?—We have some little hold upon the men by that, they would not be running about and leaving their work so much.

2455. So that a man commencing work is not entitled to his pay for two months?—No, unless he has some advanced to him, but when a man leaves a mine he has a month's wages coming from that mine.

2456. That is supposing that he is not out of work?—Yes, if he is out of work he gets nothing, but at the end of the month we advance him some money, there is hardly a month but what we do that.

Mr. **Robert Dunstan.**

3584. (*Chairman.*) What is the amount of the house rent which they have to pay out of that?—That is daily; the firing is daily, and they are exposed to a great deal of imposition in many ways. They are only paid once in a month, and they go in debt to the little shopkeepers, and they pay the dearest for everything.

3585. Are they not one month in arrear?—Yes.

(G. *d.*) *Month in Hand.*

3586. And a man just commencing to work must work for two months before he receives his pay?—Yes.

3587. During the first month does he have credit?—Yes.

3588. In some mines they allow subsist money, do they not?—Yes, in some mines.

3589. If not, the miner must deal on trust at the shop?—Yes.

Mr. **Samuel Higgs.**

7859. (*Chairman.*) Though the settlings are monthly, there is always a month in hand of the pay, is there not?—Yes.

7860. Will you state why there is always a month in hand?—We cannot measure the work and make up the cost in much less than a month; we might do it on tut bargains in a fortnight, or perhaps less, but it takes a month for the tribute; we do not like to have more public days in the mine than is necessary; one day is enough for settling and paying.

Capt. **Charles Thomas.**

8808. (*Chairman.*) Then must he not go to a public-house, or to some shop to get it changed?—Yes, to a shop they go on taking up a month's meat before they have money to pay for it. They get into debt for a month, and then they go to a shop to pay for it; a large portion do this.

8809. They are always a month in arrear, are they not, in receiving their pay from the mine?—Yes, always in all the Cornish mines.

8817. I mean that they would have to wait for two months before they got anything?—Yes, except as a favour.

8818. In those cases, is it your belief that they give for subsist more than 1*l.* a month to the tutwork men?—I do not know; we give 2*l.* to the tributers, and 3*l.* to the tutwork men, but no subsist at all for a month except a man asks for it as a favour, and then we do.

8819. Suppose a man does not receive any pay for two months, he must necessarily begin by getting into debt?—Yes.

Capt. **Thomas Richards.**

8908. (*Chairman.*) A miner works two months, does he not, before he is paid one month's wages?—Generally.

Mr. **Joseph Vivian**, North Roskear.

9072. (*Chairman.*) How much subsist do you advance to a tutwork-man?—We do not profess to advance to a tutwork-man, though we do it occasionally. We do profess to advance to tributers; the tutwork-men wait for the pay day, and take up their money as they like.

Mr. **Robert Hart Pike.**

9158. (*Chairman.*) In your opinion would there be any possibility of paying the tutwork-men other than once a month?—I should consider that it might be done. I believe that it is done in many of the foreign mines, the St. John del Rey and most of the mines in Cuba, and various other places.

9159. Might not a more frequent payment of wages in a great measure prevent the men from getting into debt?—It would obviate the necessity of it in a great degree.

9215. (*Mr. Davey.*) Do you think that it would be possible to pay the tutwork-men once a fortnight?—Not to measure up.

9216. Do you allow any subsist money to the tutwork-men?—No.

9217. In some mines the tutwork-men get 1*l.* subsist at the beginning of every month?—That is equivalent to a fortnightly payment.

9218. Say that this is the 1st of August, those people who worked in certain mines in July received last Saturday 1*l.* each, and on the third Saturday they are paid off?—You pay them for July in August.

9219. The whole of the work done in July will be paid off in the third week in August?—Yes, that is three weeks behind.

9220. (*Chairman.*) The case as stated in St. Agnes where a man is paid all off is not the case here; there is still a month's work due to him in this district?—

(G. d.) *Month n Hand.*

The pay days in the mine that I am connected with in St. Agnes happens to be nearer to the mouth of the labour doing; it is rather accidental, I think, than otherwise; there is always a month in hand.

9221. Do you think that the plan of paying up in full at the end of three weeks would be desirable?—Yes.

Capt. John Michell.

10,093. (*Chairman.*) So that if a man goes fresh to a mine, and does not get any money for two months, he must go to the shop to a certain extent?—He comes from another mine.

10,094. But suppose that he is out of work?—Then he must have subsist. Where a man is in debt he cannot find fault with weight or anything.

Capt. James Phillips.

11,745. (*Chairman.*) Do you know what he receives per head from each man?—I think it is 9*d.*; we have no money in hand in the mine the same as some have.

Mr. William Gard, East Gunnislake, &c.

19,168. (*Chairman.*) And do you keep a month in hand?—Yes.

(G. e.) *Men spaled or fined.*

(E.)—MEN SPALED OR FINED.

Mr. James Seccombe

1354. (*Chairman.*) The men are fined, are they not, if they come up before the time?—If they are up pretty much before the time.

1355. Do they ever wait in the shaft before they come up?—Sometimes they come, and sit down in the plat, where there is a dry place.

1356. Why have those men left their work before the time?—We find that men in the beginning of the month do so sometimes; they do not do it so much towards the latter end of the month; they take things then very steadily, when it comes to the latter end of the time. When the month is just up they work harder sometimes, and we find the men are inclined to stay down an hour or two longer than the time. Some are very indifferent towards the time when they ought to come to the surface.

1357. Have they any means of judging of the time except by the candles?—They can tell very nearly by the candles; but some of them carry down a watch too.

Mr. Peter Clymo.

2268. (*Chairman.*) Do they come up before their time?—Very seldom; I believe if they are found to come up before their time and the agents see them they will have a fine.

A Miner, No. 3.

3018. (*Chairman.*) Do the men ever stand on the ladders waiting if it is before the bell rings?—Yes; they lie about rather than go in to get fined; they would rather lie about anywhere.

3019. So that they stand on the ladders?—They stand or lie about on the levels or anywhere, shivering with the cold sometimes.

3022. Therefore they wait on the ladders and about the ends?—Yes, anywhere. If it is dark they will come up and lie about anywhere rather than be spaled as we call it.

A Miner, No. 5.

3060. (*Chairman.*) You come up whenever you like, do you not?—We are not allowed to be up before two o'clock, that is as a custom; if we do we get find.

3101. (*Chairman.*) Standing on the ladders?—Yes, and hiding in holes out of the agent's sight; and it is very cold and draughty in some places.

3102. (*Mr. A. Bruce.*) Why did you leave your work before the proper time?—Because we had no guide to go by as to the time more than our candles.

3103. Is not that enough when you get some experience?—Sometimes the candles are not so good as at other times.

3104. How did you know that you were not in proper time when you got to the top? Had not you the same means of knowing at the bottom as you had at the top, whether your time was up or not?—We saw the men who were engaged in landing the stuff, and inquired; that is the information which we get chiefly.

(G. e.) *Men spaled or fined.*

Mr. Christopher Childs.

I find that among tutwork men who have done their work below, they are prohibited from coming to grass until the bell has been rung, which would summon them up; that if a man should come to grass before the bell is rung he would be spaled the sum which the agent inflicts as a fine, and, as I am informed, that is usually 2*s.* 6*d.*

3124. (*Chairman.*) The men do stand on the ladder way?—Yes.

3125. Do they get cold in consequence?—When I have inquired of the working miners themselves, as tutwork men, I have almost invariably found that their desire to get to grass before the relieving corps comes down, and has command of the ways, is in order that they may take their time in passing through the levels and up the winzes, or whatever they call the footways in the mine, and they remain in the ladder-ways near the surface waiting for the bell to ring. Above the adit level there is a continuous current of air, and the fact of a man, heated with the exercise of climbing and travelling in the ladder ways, then sitting there to rest, must of course, be injurious to his health.

3152. (*Mr. Kendall.*) If the miners were to be allowed to come direct to the dry, instead of waiting in the shaft for some time before the right time for coming to the surface, how would you prevent the abuse of that privilege?—By requiring the men to go into a sitting room, which should be well warmed, and where they might have their own refreshment provided by themselves, and they would be required to wait there until they had answered some roll-call or answered their names to the agent.

3153. Would there be no abuse in that; might not a man, in that case, come up an hour before his time?—He is obliged to do a certain amount of work in the course of the month, or he does not get his wages, and I believe that the tutwork-man has very little opportunity of getting more than such wages as the agent chooses to fix. If a miner has driven beyond his stent, and has a soft piece of ground in his end, he will derive little or no advantage from that in the next month's taking, except in this, that he, perhaps, will execute the work in less time, and will have more time at his own command.

3154. According to your idea, a miner should be enabled to leave his tutwork pretty nearly when he likes?—Yes; it is set to him at per fathom, which he is to drive in the month.

3155. And he may leave when he likes?—Yes. I know not why he should not do so, if a man drives his quantity of ground. I know that the suspicion on the part of the agent is, that a man should not be allowed to run away when he pleases, and therefore he keeps him down this trap hatch.

3163. (*Chairman.*) Do you think that the tutwork men would abuse the privilege which you have suggested that the miners should have?—I think not seriously, if they did not work the quantity of ground they could not get the wages. It is rather an amusing thing if you go underground to see the setting of a stent. the agent himself does not wish to be what he calls baffled by the miner, and if the miner can drive a fathom of ground in a shorter time than the agent sets him, the agent may think that perhaps he may not stand so well in the opinion of his employers as he otherwise would do. The agent's object is, as far as he can, to show that he is clever in his way of setting, and that he has allotted the man a fair amount of work for the two months, supposing he works eight hours; but a working miner can very frequently execute the work in less time, and come to grass, if allowed to do it.

Mr. Robert Dunstan.

3526. (*Chairman.*) You say that they catch cold from waiting; do they ever stand upon the ladders before they come up?—They are obliged to do that, for no man can climb 100 fathoms right away.

3527. Do they wait above the adit level on the ladder?—Yes, some do, but that is their own fault. They are not allowed to come up generally. There must be discipline where there are 400 or 500 men.

3528. But they do come up and wait there, do they not?—Yes, I have done it myself.

(G.)—WAGES AND DEDUCTIONS.

e.) Men
or fined.

3529. That is because they would be fined if they came to the surface?—Yes.

3530. By what means does a miner ascertain what the time is?—He can tell by his candles.

3531. Is no signal sent down to him?—No.

3532. When a miner has completely blasted his holes, which I suppose he does generally near the end of his time, where can he go?—It is a great folly to detain him. If a man is working in a close place he blasts his holes, and then the place is not fit to go into for hours, for it would be very injurious to breathe the hot powder smoke. It is, therefore, great folly to force a man to do it when he can help it. I could overcome that by giving men a fair price for their work, and let them get as much as they can get.

3533. Might not a miner be allowed to come above ground, and go to some place and wait?—He would not want to wait; he might come up and put on his clothes, and go home; there is no object in keeping him waiting.

3534. But what security would you have that a miner did the full extent of the work that he had undertaken to do?—You do not want any security if a man is not paid for more than he gets. We have what is called stent, and the meaning of that is, that a certain portion of work is set to a man, and he has a certain amount paid to him for doing it; so whether he does it in six hours or eight hours it matters not to the miner.

3535. Then why do you suppose that the rule is so very general that the miners are not allowed to come to grass?—I have no supposition upon the point; I know it.

3536. But why should it be so general?—I can hardly tell. I never could conceive the reason for it. I know that there is no good in it.

3537. Is it not injurious to the men?—Yes.

3545. (*Mr. St. Aubyn.*) But if he is not present how is he to prevent a man sitting down for the last half hour that he is down?—The common rule is, when the agent comes in, for the men to sit down; they never work while he is there; he would want to look at the lode, and see what the work was worth; and the common practice is, that the miners, who are a very civil class of men, as soon as the agent comes in, stop their working, and they go back for him to examine the work.

3546. (*Chairman.*) Suppose there was half an hour or a quarter of an hour's law given before they were allowed to come up, do you think that would be abused?—It would amount to the same thing precisely. I see no good whatever in keeping a man from the adit between the adit and the surface till the bell rings; there is little good in it; it is not carried to the same extent as it used to be.

3547. But it is carried out to some extent?—In some mines I dare say it is.

3548. (*Mr. St. Aubyn.*) Self-interest will generally induce a man to work as long as he can, will it not?—Yes; and the great point is to give a man as much work as he can do in a month, and a fair price for his labour; that is all that is necessary.

3549. You stated that a rule was adopted to restrain as far as possible any idling in the bottom of the mine?—In the best regulated mines, where the agent is not cramped by the adventurer, and where the agent is an intelligent man, he gives a fair price for the work that he has to let, and gives a man as much work to do as he can during the month. Then a man, if the system of what is called the monthly allowance is not adopted, thinks he may get 4*l.* or 5*l.*, and there is no restraint upon it; he is allowed by dint of his own skill and manual strength and industry, to do what he can, and then he pursues his labour with a greater degree of interest. But the other system, where the monthly allowance is made, entirely destroys that.

3550. Will you be good enough to explain what you mean by the monthly allowance with reference to tutwork?—The monthly allowance is of this kind. When a man comes into a mine and asks for work, he also says, "What do you allow?" "We allow 3*l.* or 3*l.* 5*s.*" Then if the adventurers are close upon the agent, the agent is not expected to allow a man to get more. And I mean that that system destroys the energies of the men, because the miners are a calculating body of men, and a miner says, "I must not get more than 3*l.* or 3*l.* 5*s.* I may as well get it easy as hard." But if the captain or the manager is unshackled, and he is allowed the full exercise of his own judgment in conducting the whole of the operations of the mine, he would do as I have said. I will just give the Commissioners my own history upon this matter. When I have been asked this question, "What do you allow?" I have said, "Nothing; I make no allowance. I fix the price upon the work, and you may get as much out of it as you can. You may get 3*l.*, 4*l.*, or 5*l.*; there is no stint to your getting." Then a man goes to work, and uses his best skill and his best energies.

(G. e.) Men spaled or fined.

Mr. Francis Puckie.

4992. (*Chairman.*) In those shafts where they still use the ladders, may the tutwork men come up at any time, or are they fined if they come up shortly before the time?—There is a regular time allowed for them to come up.

4993. Are they fined if they come up before the time?—Sometimes they come up too soon.

4994. Do they wait below until it is time to come up?—Some do, and perhaps some do not; we are disposed to think that some wait on the ladders.

4995. If they stand on the ladders waiting, will they catch cold?—They will certainly.

A Miner, No. 1.

5913. (*Chairman.*) Have you never been fined for being too soon?—I cannot say that I never was fined, because I have been.

Mr. John Nankervis.

7249. (*Chairman.*) If an accident occurred to a man from his not using the wooden instrument he would forfeit his club money?—Yes.

7250. Has that ever happened?—Yes, occasionally.

Capt. Stephen Harvey James.

7471. (*Chairman.*) In letting the ground to your tributors and tutwork men, is it equally their business to carry the deads away?—Yes, to bring them to shaft.

7472. If you found them accumulating, what would you do?—There would be a noise about it; they would not be paid until they had cleared their work.

7473. Would a man be spaled for it?—No; but there would be a noise about it. I do not think you can spale any men in this place, they would be off to another place; they are just as independent as yourself. All the spaling that you can give them is to say, "If you have not completed your bargain altogether we will not pay you." We cannot spale here, the men are masters here, and they have been masters for years.

(*f.*)—PAYING IN NOTES.

(G. *f.*) Paying in Notes.

Mr. James Sicombe.

1444. (*Chairman.*) When you pay the men (the pairs) do you pay them the full sum in notes?—If they are a pair together, like eight or nine men, we might pay them nearly half the money in notes, the remainder or nearly all the remainder, in sovereigns; and some silver generally goes out. Then, if we have got three or four or five or six of the surface men, if they have got to receive 2*l.* or 3*l.* or 3*l.* 10*s.*, we should manage in this way: the pit pairs would take so many sovereigns, so many half sovereigns, and the remainder in silver; and as I know exactly what I want when I am going into the bank, I take so many notes and so many sovereigns down. With regard to the other pairs, every body that has got to receive so much, say a sovereign, will be paid in sovereigns, and every one that has got to receive half a sovereign will have it, and everybody below that sum will have to take change.

1445. If the men wanted change for their notes, would you give them change?—If they were to say we would like to be paid in sovereigns altogether, or in notes, we should do it for them.

1446. But suppose they did not get the change from you, how would they change their notes?—They generally go to have something to drink upon the settling day, if there is no money to be received at all on the pay day.

1447. Do they obtain change for their notes at the public house?—Yes; they go and pay what they have on the settling day as well as anything else.

1448. Is it general among them on the settling day to go to the public house?—That is where most of them go, after taking their month's bargain, to have a little beer.

Capt. Richard Boyns.

6782. (*Mr. Holland.*) Does the mode of payment induce them to go to the public-house materially?—No; I think not.

(G.)—WAGES AND DEDUCTIONS.

(G. *f*) *Paying in Notes*

Capt. Stephen Harvey James.

7589. (*Mr. Davey.*) On pay-day do you pay in notes or in gold mostly?—We pay about one half in cash and the other in notes.

7595. (*Mr. Kendall.*) Your idea is, that whether they had notes to change or not they would go to the public-house?—Yes.

7596. From your experience, is it not a fact that in order to induce men to come to their public-houses, the publicans get a large quantity of small change in order to accommodate the miners, so that they may split up the larger sums of money paid to them by the purser?—I should think that there is something of that sort still carried on. I think that the shops and public-houses are prepared to receive the 5*l.* notes, and to give them their change if they come to pay their accounts, but I think that there is very little credit at the public-houses with us.

Capt. James Bennetts.

7763. (*Chairman.*) What proportion of notes and gold on your pay day do you pay?—I think that we pay a quarter of our money in notes.

Mr. Samuel Higgs.

7862. (*Chairman.*) And if it is on the Saturday, is the Monday following also a day on which no work is done?—We always pay on the Friday afternoons, and every Monday is alike in our mines.

7866. If the pay is on the Friday, do the men go to work on Monday morning?—Every man is in his place on Monday morning; every Monday is alike in all our mines.

7932. In paying your men are they paid partly in notes and partly in gold?—Partly in notes and partly in change.

7934. What proportion of notes and of change do you pay?—We pay a third in notes, or a quarter, just as it happens. To those who get 5*l.* we pay a 5*l.* note; if men live together and they get 5*l.* we pay them in a 5*l.* note; but if the pair are scattered and are in different parts of the country we pay them in change. We just ask the clerk as we go on, "Can such a pair take a 5*l.* note or two or three," and if he is up to his work, he says, "Yes, one or two."

7935. Would there be any difficulty in paying them all in gold and silver?—The bankers would rather that we took it in 5*l.* notes, but they are rather indifferent about it now; formerly it was quite an object to them to pay in notes, but now they do not care much about it. We have no difficulty in Penzance at all; we get a large quantity of change.

Mr. John Nancarrow.

8513. (*Mr. Holland.*) Are the pairs paid in such money that they can easily divide it amongst them?—They are paid in bank notes generally, and sometimes in sovereigns.

8514. Would it not be a great advantage and convenience to pay them in small money, so that they could divide it amongst themselves without having to go to a public house for change?—It might be; but the greater part of them do not go near any public house at all.

8515. Where do they obtain change?—I do not know where they get it.

Capt. Charles Thomas.

8806. (*Chairman.*) In paying the miners, what proportion do you pay to them in notes and what in gold?—In Dolcoath mine, which may be taken as a guide for all the other mines, the money paid away is about 3,000*l.* a month for labour, and we pay 1,000*l.* in notes and the other 2,000*l.* in gold and silver; about 200*l.* in silver, and the other 1,800*l.* in gold.

Capt. Thomas Richards.

8961. (*Chairman.*) In paying the miners their wages what proportion do you pay in bank notes and what proportion in silver and gold?—We generally get from the bank about half notes and about half gold and silver.

8962. Do you think that the circumstance of paying the miners in notes induces them to go to a public house to get them changed?—They cannot change them anywhere else if they are paid in notes, as a rule.

Mr. Robert Hart Pike.

(G. *f*) *Paying in N*

9157. (*Chairman.*) Do you think that in paying the men the payment of a large part in notes is any inducement to go to the public-house to get them changed?—No doubt of it; that is, where a number of men are paid together, and the sum of 5*l.* exceeds the amount payable to any one of them. Then, of course, it is necessary to obtain change, which I believe is only obtained at public-houses, and of course it necessitates spending a portion of money.

Capt. James Pope.

9943. (*Chairman.*) Do you know what proportion of the money is paid to the men in notes and in change?—I think two-thirds is paid in notes and one-third in cash.

9944. When the men are paid in notes where do they get change?—They frequently go to some inn and get change, and some of the men who are in tolerably good circumstances keep money in their pockets on the pay day and change the notes for the others, because they can change all the local notes in any market town.

Capt. William Rutter.

10,149. (*Chairman.*) What proportion of notes and cash do you pay?—About half.

Mr. Philip Vincent.

10,460. (*Mr. Kendall.*) Talking of the pay day, do they spend much of their money at the public-house?—Yes. I know one publican who does an immense deal in that way.

10,461. He prepares a large quantity of small change in order to accommodate the miners?—Yes; he gets a lot of silver.

10,462. According to the present mode of pay, the men having a large quantity of notes, I suppose they cannot divide their money without having some mode of change?—They very often go to the bank, and change their notes. The miners' bank make it, I believe, a point to change their own notes, so that if the men wish to do it, they can.

10,463. There are available means without going to the shop?—Yes.

10,464. If they go to the public-house, are they expected to drink anything out of a 5*l.* note?—Yes.

10,465. How much?—I cannot say; it depends upon the pair. A certain pair go to a public-house, and they will sit down there, and perhaps they cannot pay all this time, and they come next pay day, and pay then. A pair of men very often at the public-houses are looked upon just the same as I should look upon a patient. The publican says, "Such and such a pair come here," and they generally take a pretty good quantity. One could not go to a public-house, and get his note changed, unless he drank something.

Capt. James Phillips.

11,746. (*Chairman.*) In paying the men what proportion of notes, and what proportion of silver and gold do you obtain from the bank on pay days?—The paymaster, the manager, and purser of the mine, always brings cash, generally gold and silver and pence, hardly ever any notes, because it is more convenient for the men to change.

Capt. Zacharias Williams.

11,889. (*Chairman.*) In paying your men what proportion of notes and of gold and silver do you obtain from the bank?—We never pay in notes; our is generally in hard cash, gold and silver and pence; sometimes if there is a large pay required we may have a few five pound notes.

11890. Does the bank object to give you all the money in cash?—No.

Mr. Joseph Matthew.

18,896. (*Chairman.*) Do you pay in notes or in change?—All in small money; we pay no notes.

Mr. William Gard, East Gunnislake, &c.

19,170. (*Chairman.*) Do you pay in notes?—I pay in gold and silver always.

(*g*).—GETTING INTO DEBT.

(G. *g*) *Ge into Deb*

Capt. Stephen Harvey James.

7597. (*Chairman.*) Is there much credit at the shops here?—I am afraid there is too much credit at the shops.

(G.)—WAGES AND DEDUCTIONS.

g.) Getting Debt.

7598. Can you account for that?—I suppose that the hope of reward sweetens labour. I suppose that they hope to profit by it.

7599. If the men were paid oftener, would it not prevent that to some extent?—No, I think not; once a month is often enough to pay people

7600. But a man coming to you from another part of the county would not receive any payment for two months?—Yes, he would, if he came to me and wanted money.

7601. But according to the rules, he would not be entitled to get any money for two months?—No; but then we should grant him subsist.

7602 But if you did not grant him subsist, it would induce his getting into debt at a shop?—It would

Capt. Charles Thomas.

8808. (*Chairman.*) Then must he not go to a public-house or to some shop to get it changed?—Yes, to a shop they go on taking up a month's meat before they have money to pay for it. They get into debt for a month, and then they go to a shop to pay for it; a large portion do this.

8809. They are always a month in arrear, are they not, in receiving their pay from the mine?—Yes, always in all the Cornish mines.

8817. I mean that they would have to wait for two months before they got anything?—Yes, except as a favour.

8818. In those cases, is it your belief that they give for subsist more than 1*l* a month to the tutwork men?—I do not know; we give 2*l*. to the tributers and 3*l*. to the tutwork men, but no subsist at all for a month, except a man asks for it as a favour, and then we do.

8819 Suppose a man does not receive any pay for two months, he must necessarily begin by getting into debt?—Yes.

Capt Joseph Vivian. North Roskear.

9084 (*Chairman.*) But that is the consequence?—Yes; very often a great many get in debt to the small shops who ought not to do so; they are living faster than their means will allow, and faster than they have occasion to do

Capt. John Michell.

10,093. (*Chairman*) So that if a man goes fresh to a mine, and does not get any money for two months, he must go the shop to a certain extent?—He comes from another mine.

10,094. But suppose that he is out of work?—Then he must have subsist. Where a man is in debt he cannot find fault with weight or anything.

George Smith, Esq., LL D.

10,287. (*Chairman.*) Do you think that a large number of the miners are in debt to the small shopkeepers?—That is most certainly the curse of the population.

10,288. Does that arise in any degree from their always being a month's pay in hand?—I am afraid it does.

10,289. You think that a more frequent payment would be an advantage?—I think that a more frequent payment would be very beneficial.

(*h.*)—PACKMEN.

(G. *h.*) *Packmen.*

Capt. Joseph Vivian, North Roskear.

9085. (*Chairman.*) Do you think that the packmen induce the families of miners to get into debt?—Yes, and other people to.

9086. You think that the packmen going amongst the miners' families are a great evil?—I should suppose that they may be, but I think that they keep the shopkeepers in check, for they sometimes sell things a little below; they have no establishment to keep up.

9087 (*Mr. St. Aubyn.*) But they give credit?—They do.

George Smith, Esq., LL.D.

10,290. (*Chairman.*) Do the miners' families get into debt through the temptations afforded them by travelling packmen?—Yes.

10,291. Has any means ever occurred to you of putting a stop to that to any extent?—No, I do not know what could be done in a legislative way to prevent it. These men certainly inflict serious injury upon the comforts and the morals of the people. They go round with their packs, and they exhibit their finery, and coax the women to take it, and tell them that they may pay 6*d*. a month or 1*s*. a month, or anything of that sort, and when once the goods are received they have them entirely under their power, and summon them by a dozen at a time to the County Court

10,292. Are the parents responsible for the debts incurred by their children to these packmen?—The debts are generally incurred by the parents, or with their knowlege

10,293. (*Mr. Holland.*) By the wife?—By the wife generally.

10,294. (*Chairman.*) Do all these packmen pay licence?—Yes; a hawker's licence.

(*i.*)—CONDITION OF MINERS.

(G. *i.*) *Condition of Miners.*

Capt. T. Richards.

8902 (*Mr. Holland.*) You do not mean that there should be any deficiency of food?—No; I think that if our men had better wages generally—of course some men are provident and some are improvident—but it is surprising as to food; we find some very good men taking very little animal food. In the Lelant Hills, high country, especially there is a great deal of gruel and vegetable food, and not much animal food. In the western district, from St. Ives to the Land's End for instance, or St. Just, they are men who do not eat much animal food; they take more gruel and vegetables, and they are strong men

8903. Do they eat much wheaten bread?—Yes.

8904 Is it wheaten flour?—Yes, if ever so little.

8905. (*Chairman.*) Do they get milk?—Yes, very often in those country places.

Mr. Joseph Matthews.

18,904 (*Mr. Kendall.*) Do you know much about the condition of the miners on the surface, their mode of living, and so on? Do you visit them much?—I see them and know their gettings. The general getting is about 2*s*. 4*d*. or 2*s*. 6*d*. a day.

18,905. Is the condition of the miners better now than when you first knew them?—Very much better.

18,906 Taking them as a body of men, are they more careful than they used to be?—I think so, very much.

18,907. More temperate?—More temperate.

(H.)—JOINT STOCK COMPANIES.

(H.) *Joint Stock Companies.*

Mr. Christopher Childs

3134. (*Chairman.*) In some of these mines, I suppose there are a very large number of adventurers?—I am sorry to say that the practice obtains now of dividing the shares into a greater number; some people hold the opinion that it is an advantage for persons having small means to be able to invest their money in what they call good dividend-paying mines; but I believe myself that it is increasing the evils which are found to exist in this country by so dividing the responsibilities, and by such a constant change of shares from hand to hand, that there is almost an inability in certain mines to fix who the adventurers are.

Mr. Richard Quiller Couch.

6557. (*Chairman.*) Have you found any difference on proper representations being made, in the attention that is paid to them?—Yes; I think that those persons who are *bonâ fide* miners take more care of the health of the miners than persons who are in to-day and out to-morrow.

(H.)—JOINT STOCK COMPANIES.

Mr. Robert Hart Pike.

Stock Companies. 9160. (*Chairman.*) In carrying out any improvements in the working of mines we have been told that there is some difficulty on account of the stoppage which it would occasion in the works. Would not also part of the receipts of the adventurers be stopped for that time? —That is a cause alleged for the non-carrying out of very many improvements in mines. I have found it given as a reason and an excuse in many instances.

9161. Therefore, to those who look for a permanent investment in the mine it is a disadvantage?—It is a disadvantage because, unfortunately, mining is not looked upon generally as a permanent investment. The greater number of people engage in mining simply with a view of raising a profit upon the sale of shares. The consideration is not so much to work a mine to a profitable issue.

9162. Does not that system tend to prevent improvements which would benefit both parties?—Yes, no doubt of it. Mines so got up have not in view the carrying out in a miner-like manner the operations of the mine; but a mine in full and fair course of working is frequently prevented from having the benefit of measures which would improve the revenue of the concern, by the unwillingness of the shareholders, even though they are *boná fide* ones, to submit to any temporary reduction in their dividends. *(H.) Joint Stock Companies.*

9163. A reduction which would send down the value of the shares?—Yes; that is the idea, and that if it was necessary to realise, they would have to make a sacrifice.

9164. Those improvements would tend not only to the advantage of the adventurers, but also to the health of the men employed?—Improvements of that nature might be adopted, and it is generally improvements in reference to the shafts which would facilitate the miners going up and down, but they would of course have the objection on the part of the shareholders that th would diminish the amount of the returns for some time.

(I.)—CANDLES.

Mr. James Siccombe.

(I.) Candles. 1525. (*Chairman.*) Are the candles generally good, do you think?—Yes; but if we find that they are of bad quality we do not give an order for them to the same merchant.

1526. Is it a common complaint on the part of the miners that the candles are bad?—If we had bad smelling grease, and soft candles that did not last, the men would complain directly.

1527. Then you ascertain from the men the quality of the candles?—They might pass without our noticing them if a new cargo came in, but as soon as the men came to use them they would find it out if they were bad, and come and inform us.

1528. Have the men complained of the smell of the candles?—Yes; and if they have we have always tried to remedy it; but I do not know that that has occurred, I will not say that it has not, for years, about the smell of the candles.

A Miner.

1968. (*Mr. Davey.*) You spoke of the candles being of a bad quality?—Yes.

1969. Do you know that if the candles were made of the best cotton they would not give you any light under ground?—Yes, provided that the wicks were sufficiently large.

1970. But the cotton itself in air, such as you have described, would not give any light?—In some mines they have the cotton wick.

Mr. Peter Clymo.

2273. (*Chairman.*) But I suppose that in many mines they contract for their candles?—Yes, sometimes they contract for six or twelve months.

2274. And then they are sometimes bad?—The contractors will try sometimes to send in bad articles without great caution.

2275. I suppose that a bad candle is injurious to the miner?—Yes, particularly in a close place; there is a very bad smell with some of them.

2317. (*Mr. Kendall.*) You very frequently do not stop the work, but you say, "Go on as well as you can, and we will remedy it?"—Yes. I should think that the man who gave the evidence which has just been read about the candles is no miner, because if you have got a candle made of the best cotton, if that candle goes out, you cannot blow it up again; but they get the best cotton and some of this inferior cotton put together generally. If that candle goes out you can blow it up again in a moment, but if you have a candle which is made solely of cotton you will never blow it up.

2318. Will the cotton give as good a light as the other?—No.

2424. (*Chairman.*) Should you prefer a candle made of hemp and cotton mixed?—Yes, it gives a better light, and not only that, but the men sometimes in driving home through a level the candles will go out and then you cannot blow them up again if they are made with nothing but cotton, but with hemp mixed you can.

2427. Would it be any saving to the manufacturer to put hemp in instead of cotton?—The hemp would be cheaper, no doubt. *(I.) Can*

Capt. John Webb.

5378. (*Chairman.*) Can they be removed also by proper ventilation?—You can improve the wick of candles very much. There is a sort of slovenly stuff like hemp often employed in the wick of candles which gives off a cloud of smoke with it.

5379. That is well acknowledged, is it, namely, that a quantity of hemp will produce more smoke?—Yes; I think that I have a bit here now. (*The witness produced a candle.*) There are two wicks of that candle cotton and two hemp.

5380. And the hemp makes it create a great smoke? —Yes; if you were to light that candle now you would see a large cloud of smoke from it. (*The candle was lighted, and was found to produce smoke.*)

5381. Is that occasioned by the amount of hemp in the candle?—That and the amount of heat underground. Carry two of those candles into a small space six feet high, and you will see what a smoke they must occasion.

5382. Are there candles made which will not give off so much smoke as that?—Yes; Palmer's candles, of London—patent candles—which we have been consuming for years. They are made with a wick which gives no smoke.

5383. And will that answer in a mine?—Yes; miners like them after a little while.

5384. You have used Palmer's candles in your mine? —I have used them for years for the sake of doing away with this smoke.

5385. Is that smoke occasioned by the wick or by the bad tallow?—I think that it is from the wick.

5386. You find that the men in your mine are satisfied with the candles?—Yes; they like the Palmer's candles better; but I should think that you might put the same wick with this kind of tallow as Palmer uses.

5387. Where did that candle come from?—These candles are made by the merchants in this neighbourhood. The candles generally are of this kind in our mines.

5388. What is the difference of price between Palmer's candles and those candles?—I think that Palmer's candles are 3*d.* per dozen pounds more than these. We buy them at per dozen pounds.

5389. What is the cost of a dozen pounds?—It varies a little according to the tallow. I think that these candles now are 6*s.* 9*d.*, and that Palmer's candles are 7*s.* per dozen.

5390. Do you charge anything extra to the men?—We charge the men generally a penny a pound more than the candles can be bought for from the merchants. In some mines they charge 8*d.* when they do not give but 6*d.*; in some mines they charge 7*d.* They generally charge about 1*d.* a pound more.

5391. They charge the men 1*d.* a pound more than what they pay for them?—Yes, generally throughout the county. This is a thing which has hardly come

(L.)—CANDLES.

Candles

under anybody's notice; but I have been long making my observations upon it, and saying what a nuisance it is in a small place where there may be two or three men working with two or three candles, and this dense smoke is going away in a small place. I used to take two of those candles, and go into a small room, and light them up on the table for about half an hour, and it was almost suffocating.

5392. Do you think that the men who work under you are more satisfied with your mine, and that they prefer it?—They prefer Palmer's candles after they know their value.

5459. (*Mr. Davey.*) You said that some of the men objected to Palmer's candles; can you state the reason for that?—They objected at the beginning, but afterwards they liked them; there was a little smell with Palmer's candles which they did not fancy at the beginning.

5460. Supposing there should be any accident and the candle went out, could they restore the light again and blow it up?—No, they can never blow up Palmer's candles.

5461. And that is the great objection to Palmer's candles, is it not?—I do not see any disadvantage in it; they always take lights with them; there is another man with them.

5462. Do you know why, in the candles to which you object, hemp is put with cotton into the wick?—No; but they have been accustomed to do so.

5463. Do you know that it is because the men can blow the candle up in case it goes out, and not be left in the dark?—No, I do not think that it is for that purpose.

Capt. Richard Boins.

6739. (*Chairman.*) With regard to candles, what do the men pay for the candles?—9*d*. per lb.

6742. What is the average price for which you get candles and powder?—Candles I should think at about 6*s*., from 5*s*. to 6*s*. Of powder, 54*s*. or 55*s*. is about the average.

6744. Are the men allowed a certain quantity of candles each time they go down?—Two lbs. are delivered on Monday morning for the week.

6745. Are they never allowed any more?—Scarcely ever. A great many applications are made for additional candles, but we hold that all increase of consumption will come out of the adventurers' pocket.

Capt. Thomas Trahair.

6951. (*Chairman.*) What do the men pay you for candles?—9*d*. per pound.

6954. Is there a specified quantity of candles allowed to the men?—The quantity allowed is 2 lbs. per man per week.

7039. (*Mr. St. Aubyn.*) I believe your mine was lighted by gas?—Yes.

7055. The same sum as for candles?—No, not so much by a sixth part. Of course the candles would cost them 1*s*. 6*d*. a week,—2 lbs. a week at 9*d*. a pound, and for the gas we charged them 1*s*. 3*d*. instead of 1*s*. 6*d*.

7059. Were the charges that you made upon the men sufficient to provide the amount that you had to pay to the company?—Yes.

7060. So that you lost nothing by it?—Of course we never did.

7061. The result of your experience with regard to gas is that if the company managed it properly it would answer to introduce gas into the greater part of the mines in this country?—Yes; if the mines were well ventilated.

7062. And further, that it would be both economical to the adventurers and to the men?—Yes.

7063. Without any detriment to the air or to their health if it were properly managed?—There would be no detriment whatever.

7064. (*Mr. Holland.*) Do you know how many jets they use?—I cannot say.

Mr. John Nankervis.

7263. (*Chairman.*) What do the men pay for candles?—9*d*. a pound.

7264. Are they limited to a certain quantity in a given time?—Not exactly; but there is a certain quantity mentioned generally, and if they are working longer or anything takes place so that they require more, they have more supplied to them.

(L.) Candles.

7265. What is the general quantity that you allow the men?—About 2 lbs. a man per week.

Mr. Henry Boins.

7372. (*Chairman.*) What quantity of candles is allowed to each man?—2 lbs. a week per man.

7374. What is the charge made to the miners for candles?—9*d*. a pound.

7377. What is the contract price of the candles?—It is about 6*s*. for a dozen pounds, at present about 6*d*. a pound.

Capt. Stephen Harvey James.

7490. (*Chairman.*) With respect to the candles is there a limited allowance of candles to each man?—I think there is, generally.

7491-2. What do they cost you a pound?—About 5½*d*. or 6*d*., delivered here.

Capt. James Bennetts.

7724. (*Chairman.*) What amount of candles are the men allowed, how many lbs. a week?—They are allowed about 2 lbs. each.

7725. What do they pay for them?—They pay 8*d*. a lb.

7726. What kind of candles are they?—They are very good candles. I do not know what name to give them.

7727. Are the candles from London?—We have our candles from Mr. Higgs at Penzance.

7728. What is the price of them per lb. wholesale, as you get them?—About 6*s*. 6*d*. or 6*s*. 9*d*. a dozen now, I think.

7788. (*Mr. Kendall.*) Why do you charge your miners more for the powder which they have of you than you give for it at the merchants; and why do you charge more also for the candles?—There is an understanding with miners generally, that if they can have candles at a lower rate at the mines than they can from the shops, they will carry candles home from the mine; and it is a check that they shall not be taken away. Generally there is a calculation made of about what the men shall get in a month, and in that respect the price which they are charged does not matter, and it will prevent their taking the candles away.

7789. If you were to let them have them at the same rate as you buy wholesale from the merchant, have you any idea that they would be enabled to sell cheaper than people could elsewhere?—Thousands of pounds of candles have been carried away from the mines and sold by miners at the present price.

7790. And therefore thousands more would be sold if you put a lower price on?—Yes.

7791. (*Chairman.*) What is the price at the shop of a pound of candles?—I suppose about 7*d*.

7792. Then there is 1*d*. difference?—Yes.

7793. I thought you stated that the miners were only allowed 2 lbs?—They are allowed 2 lbs. a week, but sometimes there are boys working with the men, and the boys may not have much to do, the boys have the same quantity as the men have; and while the under people and boys are not employed working, the candles are put out. Sometimes the men are engaged at the surface spalling their stuff, and then they can accumulate their candles, and sometimes, though rarely, they steal from each other.

7794. (*Mr. Davey.*) Do your men all work single-handed?—Principally; but sometimes when the ground is very hard they work double.

7795. How many hours do you suppose they work?—I suppose that they work eight hours on an average.

7796. Would they require 2 lbs. of candles a week to do that?—No. When there are two working in one place one candle will do for the two, and two good candles will hold nearly six hours.

7797. Therefore, if you allow them 2 lbs. of candles you give them an opportunity of going to a shop to dispose of them?—If they work single, and their lights are continually burning, it will take a great deal of that quantity, and they are continually using little candles at home; they are carrying a few home in the week to burn in their own houses.

7798. But, as you say, a great many find their way to the shops now?—I have not a doubt of it, and where

(I.)—CANDLES.

(I.) Candles. the beer is sold. We never allow more than 2 lbs. of candles to go with each man.

Capt. John Carthew.

7842 (*Chairman.*) What do the miners pay for candles?—9*d.* a pound.

7844. What quantity of candles is allowed to them?—2 lbs. a man per week.

7845. Do you never allow them any more?—No.

7846. If they require more what do they do?—I do not know: I do not hear any particulars about that; the regular supply is 2 lbs. a man

7847. Could they not get any more if they wanted them?—If they were working in cores they could get some more, I dare say; if I found men that wanted more, and they were working long, I should not hesitate to give them a few more.

7848. Do you think the men sell them?—No doubt some of them do.

7849. What do the candles cost you per pound?—They cost us 6*s.* per dozen pounds, and we put an extra price upon that, we consider that the men shall be bound to use them: that they shall not sell them, or carry them home, and we make them pay 9*d.* a pound.

7851. The more they sell them the more profit you make?—Yes; but we do not think anything about that

Mr. Samuel Higgs.

7877. (*Chairman.*) What price are the men charged for those candles which you supply?—I think that they are charged 8*d.* a pound for them.

7878. What is the wholesale price?—The present price is 5*s.* 9*d.* per dozen, but that varies; last year soon after this time they were 6*s.* 9*d.*, they average about 6*s.* a dozen, but we do not vary the price to the men, we keep it steady

7879. What is the reason why the men are charged more than they cost?—I suppose the object is to make the men more careful of them; but the object is defeated, the men care very little about how much or how little they take out, I think

Capt William Stevens.

8178. (*Chairman.*) What quantity of candles do you allow to the miners per week?—2 lbs. to every man and to every boy.

8179 Do you ever allow them more than that?—No: that is their quantity, unless they break open the chest and steal the candles

8180 Without good reason you would not supply them with any more than the quantity you have stated?—No.

8181. What do you charge the miners for the candles?—8*d.* a pound.

Capt. Richard James.

8385. (*Chairman.*) What do the men pay for candles?—9*d.* per pound.

8386. What quantity of candles are allowed to each man?—2 lbs. a week.

8387. And no more?—No.

Mr. John Nancarrow.

8494. (*Chairman.*) What do the miners pay for candles?—10*d.* a pound.

8496. What is the cost price of the candles?—About 6*s.* for one dozen pounds.

8497. What is the object of charging the miners 10*d.* a pound?—As to the object I am not prepared to say. It was the custom established in the mine before I came there; I have only had the management of it for two years and a half, or barely that. I saw no reason to alter it.

Capt. Matthew Curnow.

8582. (*Chairman.*) With regard to the rules to be observed in mines, are they printed rules?—What do the men pay for candles?—They pay 9*d.* a pound.

8583 Do you limit them to a certain quantity?—Yes, they are limited to 2 lbs. a week per man.

8589. Do you know what the cost price of the candles is?—I think we pay 6*s.* 6*d.* or 6*s.* for a dozen pounds, but I am not clear upon that.

8625. Beyond the cost price there is a profit made upon the candles?—Yes.

8627. But still the men would always have to pay for them as long as they were not supplied to them below cost price?—Yes, but if a man could get them for 4*d.* a pound he would not be so nice about it. (I.) Candles.

Capt. Charles Thomas.

8756. (*Chairman.*) Do you give out any particular kind of candles for the use of the men in the mine?—We have two sorts Some come from London—Palmer's candles—which are stiffer for working in a warm atmosphere; they stand stiffer, and they do not run as the common tallow candles do

8757. Palmer's candles are better in a warm place?—Yes

8758. What is the difference between the wholesale price of the common candles and Palmer's candles?—Just nothing; one price.

8759. Do the men pay the same price for both?—Yes; they are at liberty to choose which they will have; we keep both sorts in the mines, and they may take either Palmer's or the others. All the men working in open places will take the others, but a few of the men who are working in rather warm places prefer occasionally to take some of Palmer's

8760. Does the heat of the weather affect Palmer's candles so that they stick together?—We find them so occasionally, but we think that there has been an imperfection in the manufacture then; we rather think that they may have been put together before they were properly cooled.

8760*a*. Is the light given by both the same?—Yes, the same; there is very little difference.

8761. What price do the ordinary mines pay per pound for candles?—8*d.* per pound now generally.

8762. Are they limited to a certain allowance of candles?—In some mines they are; but unless we find in any of them that they are taken out in an extravagant quantity we do not limit them. We think that the price ought to be sufficient for all reasonable men. We only pay 5*s.* 6*d.* a dozen, and they pay 8*d.* a pound so that they pay 2½*d* a pound more than we pay, and that we consider ought to be an effectual check to taking out more than they really require. There are a few men who will break through propriety in that respect, and then we mark them down and say, "You shall only have a certain number of pounds."

8763. Do you mean that even at that high price they would sell them?—Yes, they would sell them, perhaps, to buy tobacco—some reckless men

8764. The high price is not a complete check?—No; but it is a very effective thing for all the thinking steady men; for one in ten it is not a complete check.

8765. I suppose that the well-conducted thinking men would not dispose of the candles even if they obtained them at a smaller price?—No.

8766 It is only in the case of the ill-conducted men that this check is necessary?—Yes.

8767. Is it always effectual in their case?—Not always.

8768 The Commissioners have heard of a mine having been lighted with gas, in your opinion would it answer and be economical to use gas in a mine?—I do not think it would. I saw that mine that was so lighted—Balleswidden.

8769. Can you furnish the Commissioners with an account of the quantity of candles consumed or supplied to the men in one year in any one of your mines?—In Dolcoath mine the consumption is about 3,300 dozen a year, or rather more, I would say 3,600 dozen.

8770. And what in the other mines is the consumption?—In proportion to the number of men, about 2 lbs. for each man per week.

Capt. Thomas Richards.

8912. (*Chairman.*) Do you use any particular kind of candles in your mines?—We use all sorts of candles, but good candles are the best and most economical that can be used.

8913. Is there any particular kind of candle that you use?—The best quality we find the cheapest to use.

8914. What do you pay as the wholesale price for the best candles?—The price of candles varies with the price of tallow; we are entirely governed by that.

8215. At the present time what is the highest price that you pay?—There are different prices, but we can get a very good sort of candle for about 5*s.* 9*d.* for a dozen pounds.

(I.)—CANDLES.

8916. Are the miners limited to a certain quantity of candles?—The tutwork men are limited to 2 lbs. a week per man; the tribute men may have as many candles as they choose if they are getting wages.

8917. What do you charge them for the candles?—Sixpence and sevenpence a pound; we have no fixed rule for every mine; we charge just enough so that the miners shall not waste the candles; there is no object to make a profit upon them.

8918. What is the highest price of candles at Prosper United?—Sevenpence a pound.

Capt. JOSEPH VIVIAN, North Roscar.

9058. (*Chairman.*) You have stated the deductions from the men. Amongst other things, candles are deducted. Do you use any particular kind of candle?—No; they are all tallow candles. We have been using composition candles from a patent candle maker's, Palmer's. The men like them very well.

9059. Is there any advantage in your opinion in those candles over the others?—I do not know that there is. Men in close places prefer them; they give a sharp smaller light, and they do not make so much smoke, but then they are not so handy for carrying through shafts which are wet, or where there is a strong draught blowing. If they once go out, they cannot be blown up again, which can be done with an ordinary candle. If Palmer's candle goes out, you must have somebody to give you a light, or resort to your match-box.

9060. Is the price about the same?—Yes.

9061. What is the wholesale price now?—5*s*. 6*d* per dozen.

9062. What is the deduction from the men for candles?—We generally deduct considerably more than we pay,

9063. How much?—I think we are at present charging 50 per cent. more than we give. We make that sort of general rule to charge 50 per cent. more for everything, but I believe that at present we are charging 9*d*. per lb. for powder and 9*d*. per lb. for candles. We do not alter for a trifle when the price goes up and down. When they take a set they understand what they will have to pay for drawing, and candles and nails, and so on. We charge some of the tributors for timber, that is, for planking timber, not for timber for securing the ground; it is done in order to make the men as economical as we can, that is the main object, otherwise you might have to deliver more from the store, because it is all the adventurers' store; it is the same with the club and doctor. It is always looked at what a man has really carried away in cash.

9077. (*Chairman.*) As you have known him so long a time as a good man you have done it?—Yes; and although a tributor may be in debt to the mine, yet the proportion of ore which belongs to the company being in most cases more than the amount of the debt the mine will still be a gainer.

9078. (*Mr. Kendall.*) Suppose that after a while the man gets a good start?—We keep back the money.

9079. The whole of the money?—That depends upon circumstances. The man that I mention was once in debt, with two others, 70*l*.; he got money in two months and paid every farthing off; they got 100*l* each and paid their 70*l*. that they were in debt.

9080. First of all, I understand that you have a chance of being repaid in full, and if you are not repaid in full you are able to prove that on the whole, even though the men are in debt to the mine, yet, taking the profits which they make to the adventurers, there is still a balance in favour of the adventurers?—Yes.

Mr. ROBERT HART PIKE.

9190. (*Chairman.*) With regard to the candles, is there any particular kind of candles which you use?—We use those which we think are best adapted to the particular ground, or the nature of the air in the place.

9191. Do you use Palmer's?—Yes; we use some of Palmer's. In deep places, or in draughty places, I believe the men do not like them, they will not blow in again if they blow out.

9192. What is the charge for the candles to the men?—We charge 8*d*. a pound.

9193. And the same for powder?—Yes; there is a considerable profit charged upon everything, but the reason for that is to prevent the men wasting the articles;—even now, with the charge which is made, if the men are not carefully watched, they will take out a great many more candles than they really want, simply to sell them to make a little ready money. (I.) *Candles.*

9194. (*Mr. Holland.*) To subsist on?—Generally for beer money.

9195. (*Chairman.*) What becomes of the profit on those candles?—It goes to the adventurers. In making up the account of a tributor or a tutwork man, he is charged so many pounds of candles as a deduction from his earnings.

9196. (*Mr. St. Aubyn.*) Sometimes as much as 50 per cent.?—Yes, but that is all reckoned in. It amounts to the same thing. It is simply a check upon a man against his wasting too much. The estimate of the net earnings of the men is 3*l*. a month; it is just the same as with the smelters, they take 21 cwt. of ore for a ton.

Capt. WILLIAM TEAGUE.

9368. (*Chairman.*) Are the men limited as to the quantity of candles?—Yes, generally speaking.

9369. To 2 lbs.?—To 2 lbs. a week per head.

9370. What is the charge in the bill for the candles?—8*d*. I think.

Mr. JOHN RICHARDS.

9545. (*Chairman.*) What allowance of candles do you make to the miners?—2 lbs. of candles per week to each man.

9546. Were more candles allowed to them when they were working in that hot end?—When it is very hot they have 2½ lbs.; but they do not burn 2 lbs. down in those hot ends, they only keep one light.

9547. What kind of candles do they use down there?—They are made of the best tallow.

9548. Do you use any patent candles?—Yes, we do, some of them.

9549. What do you charge per pound for the candles?—Sevenpence.

Mr. JOSEPH JEWELL.

9666. (*Chairman.*) What price do you charge them for the candles?—About 8*d*. per lb.

9667. Do you vary the price?—Yes; we send out for tenders; we ask the merchants what they will supply us with candles for, for two months; and in fact, they are at this time 5*s*. 3*d*. a dozen pounds, and we let the men have them at 8*d*. In some of the mines it is 8*d*. We charge a little over in places, but that is just how we gave them out to the men before.

Capt. JAMES POPE.

9913. (*Chairman.*) What are the men charged for the candles?—I think the price is now 5*s*. 6*d*. a dozen lbs., but we generally charge them a little more than that.

9914. How much do you charge them?—7*s*.

9915. Are they limited to any quantity?—Yes; 2 lbs. per man per week.

Capt. JOSEPH COCK.

10,019. (*Chairman.*) Do you use any patent candles?—We use the hard grease, and sometimes it is of a softer nature; we get some Palmer's candles, the men do not like them very well.

10,020. For what reason?—Because the wick is not large enough.

10,021. They cannot blow it in when it goes out?—If it goes out it must stay out, unless they have a match to light it.

10,022. Has each man a supply of matches in his pocket?—One or more generally have matches.

10,023. But not all of them?—Not all of them.

10,024. What are the men charged for candles?—I think 8*d*. a pound.

Capt. WILLIAM RUTTER.

10,145. (*Chairman.*) What do the men pay for candles?—Eightpence with us.

10,147. Is it always the same price?—About the same. They do not cost us so much, but if we did not put a tolerably heavy price on them they would carry them away to barter for tobacco and other things.

10,148. Do you think that that price completely prevents it?—Not completely, but it does to a great extent.

(I.)—CANDLES.

(I.) *Candles.*

Capt. Joseph Vivian, Huel Fortune.

10,716. (*Chairman.*) Have the men a fixed allowance of candles with you?—Yes, 2 lbs. a week.

10,717. What do they pay for them?—8*d.* a lb.

Capt. William Chappell.

10,769. (*Chairman.*) Have you ever found that the candles would not burn either in driving a level or in sinking a winze?—Yes, I have seen that in winzes, and rather in rises, rising up against a winze; but I think that the great fault in that is, that you get an inferior candle.

10,770. Do you think that an inferior candle will go out sooner in poor air than a good candle?—Much so, and it creates a bad air. There is a great deal of arsenic mixed up in order to harden the inferior tallow, and there you find that that takes great effect on the man.

10,771. What kind of candles do you use, are they patent candles?—No, we buy our candles at Bristol, and we only allow the men 1½ lbs. in place of 2 lbs., and they really prefer it to 2 lbs.; they cost a little more, perhaps they cost about 3*d.* a dozen more; then we save ½ lb. on each man, so that the adventurers save by it about five sixths per cent. in the consumption. I think that there is a great fault in the inferior kind of candles.

10,772. What do the men pay for those candles?—They pay according to the price of them; they pay now about 7½*d.* or 8*d.* a lb.

10,773. What can you get them at wholesale?—We get them now at about 6*s.* 6*d.* or 7*s.*, and sometimes in the winter we have had to pay as much as 8*s.* Then we never charge a rise; when we commence the year we carry it out for the year.

10,774. Do you alter the price every year to the men?—About once a year, at Christmas time, in fixing it, it may be higher or lower.

10,775. You only alter it if the price of the candles should be lower or higher?—Yes.

10,776. You fix it every year according to the price?—Yes, we take in a large stock of candles, which, perhaps, last six, eight, or nine months. If we buy them very cheap we let the men have them at a price accordingly, but if we pay a long price for them, and it falls in a few months afterwards, they must continue to pay that price out.

10,777. In fact the men pay according to the price when the candles are purchased?—Yes.

Mr. Thomas Gill.

11,078. (*Chairman.*) Do you use any kind of patent candles?—No; we use the ordinary candles that are going in the country.

11,079. What quantity do you allow to each man?—2 lbs. a week.

11,080. What do the miners pay for the candles?—I think it is 8*d.* a pound.

11,081. Have you ever examined the candles to see whether there was any arsenic in them?—Yes, many times, but I could never detect it.

11,082. What do you think of the noxious smell which arises from the candles, or is there any noxious smell from them?—I do not think there is much in ours, but there has been in some candles that I have had. I sent up to Bristol some time ago, and I got candles from different parts, and I tried them all, and I did not find any candle that would burn sweeter than our miners' candles that we get in the country.

11,083. Do you mean that they burn with less smoke?—Yes; there is less fume arises from them.

Capt. John Burgan.

11,171. (*Chairman.*) What do you charge the men for candles?—We charge them 7*d.* per pound.

Capt. John Hancock and Mr. Michael Morcom.

11,296. (*Chairman.*) What are the men charged for the candles?—We charge the men 9*d.* a pound for them.

Capt. John Prout Daw.

11,479. (*Chairman.*) What are the men charged for candles?—8*d.* a pound.

Capt. John Taylor.

11,550. (*Chairman.*) What are the men charged for candles?—They are charged 9*d.* a pound.

Capt. James Phillips.

11,729. (*Chairman.*) Do you allow to each man a certain quantity of candles per week?—Yes, we allow each man 2 lbs. of candles a week.

11,730. What price do you charge them for the candles?—We charge them 8*d.* a pound.

Capt. Zacharias Williams.

11,852. (*Chairman.*) What quantity of candles do you allow to your men per week?—About 1½ to 2 lbs. a week per man.

11,853. Are they patent candles?—No, the common candles.

11,854. What charge do you make to the men for the candles?—7*d.* a pound; some do charge 8*d.*

Mr. William Skewis.

11,986. (*Chairman.*) What quantity of candles do you allow to each man per week?—We allow 3 lbs. a week per man.

11,987. What is the charge that you make for the candles?—In Crelake we charge 9*d.* for powder and candles.

Mr. William Goddan.

12,085. (*Chairman.*) What allowance of candles do the men get per week?—We allow them three pounds a week for the two.

12,086. What is the price of the candles charged to them?—8*d.* a pound.

Mr. James Richards, Devon Great Consols Mine.

18,775. (*Chairman.*) Are the men limited to any quantity of candles?—Yes; a pound and a half to each man.

18,776. What do they pay for candles?—8*d.*

Mr. Joseph Matthews.

18,886. (*Chairman.*) Do you know what the men pay for candles?—Yes; we have charged 7*d.* a pound for candles.

18,888. Do you know what the cost price is?—The present cost price of candles is about 5*s.* per dozen pounds.

Mr. James Hosking, Drake Walls Mine.

19,076. (*Chairman.*) What are they charged for the candles?—8*d.* a pound.

Mr. William Gard, East Gunnislake, &c.

19,158. (*Chairman.*) What is the price charged for them?—We charge the men 8*d.*

19,160. What do the candles cost you?—About 5½*d.* to 6*d.*, and very often they cost us 6½*d.*

(J.)—POWDER.

(J.) *Powder.*

Capt. Richard Boyns.

6740. (*Chairman.*) And how much for the powder?—9*d.* per lb.

Capt. Thomas Trahair.

6952. (*Chairman.*) How much do they pay for powder?—9*d.* a pound.

Mr. Henry Boyns.

7373. (*Chairman.*) How much powder is allowed to the miners?—That is at their own judgment and choice.

7375. How much for the powder?—9*d.* a pound.

7376. What is the contract price at which you get the powder?—It costs us about 50*l.* a ton; about 6*d.* per lb., but it varies in price.

Capt. Stephen Harvey James.

7498. (*Chairman.*) What do you charge for powder?—9*d.*

7494–5. What kind of powder do you use?—Principally from Kennell Mills, near Penryn.

7498. What is the cost per pound of the powder which you get?—We are charged 6*d.* a pound by the ton. We charge it as high a price as we can in order to induce the men to be as careful as they can.

7536. You have never known the use of cartridges to be general in a mine?—No: the powder which we have from Kennell is very large.

7537. (*Mr Holland.*) Is it as large as coffee berries?—No, hardly, I should think. Some of it is very nearly as large as coffee berries, but I think that that is rather in excess; it like peas just broken in two, and whole peas, and so on. Scarcely any of it will stick about the hole, but if you have very fine powder it will stick about the hole. We think that our powder is better for that reason.

Capt. James Bennetts.

7731. (*Chairman.*) What price do the men pay for the powder?—8*d.* a lb.

7732. What is the cost price wholesale?—50*l.* a ton.

Capt. John Carthew.

7843. (*Chairman.*) How much do they pay for powder?—9*d.* a pound also.

Capt. William Stevens.

8183. (*Chairman.*) What is the charge you make for the powder?—8*d.* a pound.

Capt. Richard James.

8388. (*Chairman.*) What do they pay for the powder?—They pay 9d. a pound for the powder.

Mr. John Nancarrow.

8495. (*Chairman.*) How much do they pay for the powder?—9*d.* a pound.

8498. What is the cost of the powder?—It varies in price; sometimes it is 7*d.*; sometimes it is more and sometimes it is less; now it is 6*d.* a pound exactly.

Capt. Matthew Curnon.

8590. (*Chairman.*) What do you charge the miners for powder?—We charge them 8*d.* a pound.

8625. Beyond the cost price there is a profit made upon the candles?—Yes.

8626. And the same on the powder?—Yes, and that is to make the miners take care of all those things.

Capt. Charles Thomas.

8775. (*Chairman.*) What does that powder cost?—50*s.* per cwt., 6*d.* per pound, the same price as the others.

8776. What do you charge for the powder?—8*d.* a pound generally.

Capt. Thomas Richards.

8919. (*Chairman.*) What do you charge the miners for powder?—Sixpence a pound.

8920. That is what the miners pay you?—Yes.

8921. What is the cost price of the powder?—Fivepence halfpenny a pound.

Mr. Robert Hart Pike.

9192. (*Chairman.*) What is the charge for the candles to the men?—We charge 8*d.* a pound.

9193. And the same for powder?—Yes; there is a considerable profit charged upon everything, but the reason for that is to prevent the men wasting the articles; even now, with the charge which is made, if the men are not carefully watched, they will take out a great many more candles than they really want, simply to sell them to make a little ready money.

Capt. William Teague.

9371. (*Chairman.*) What is the charge for powder?—I think we charge them 8*d.* for powder.

Mr. John Richards.

9551. (*Chairman.*) What do they pay you for powder?—They pay eightpence a pound.

Mr. Joseph Jewell.

9668. (*Chairman.*) Do you do the same with regard to the powder?—No, we charge them 8*d.* a pound for that, whatever the price of it is; but the price has been just the same for several years. If it came down to a much a lower price, I dare say that we should take it down to 6*d.*

Capt. Joseph Cock.

10,025. (*Chairman.*) What are they charged for powder?—Eightpence a pound, I think.

Capt. William Rutter.

10,146. (*Chairman.*) And what for powder?—Eightpence.

Capt. Joseph Vivian, Huel Fortune.

10,718. (*Chairman.*) How much a pound do they pay for powder?—8*d.*

Capt. William Chappell.

10,778. (*Chairman.*) Are you at all particular as to the kind of powder which you use?—Yes, I am very particular about it. I use a very fine grained powder; it is from 15 to 20 per cent. stronger than the large powder, and makes a great deal less smoke.

10,779. Are your men satisfied that that powder is as good or better for blasting than the large sized powder?—Yes, they are at present, but it was a long while before we could bring them to it, because the fine powder requires a little more work with it. If they have a wet hole they must put so much more clay in it. It takes about ten minutes longer, that is to say, to get the hole dry so that the powder shall not stick about the hole. It is that which causes extra smoke. When dry it explodes at once and soon passes away.

10,780. Do you think that a more complete explosion takes place with the smaller grained powder than with the larger grained powder?—Much more.

10,783. Have you ever seen paper cartridges made by the men, and inserted in the holes?—Yes, they make them, we supply them with paper.

10,784. Would not that save the powder hanging about the hole?—Yes, that is where they save a great amount of work. In dry ground they do not require it, but in wet ground I think that either paper or cartridges are very beneficial.

10,785. But even in dry ground, if it saves the powder, and saves the chance of accident, would not a paper cartridge be of advantage?—No, I think not in any way. In dry ground less powder will do.

10,788. How did that accident happen; did it break the cartridge?—No, in forcing it with the swabbing stick it exploded. The cartridge was so tight that after it got in a certain distance there was a certain amount of air, and it exploded and threw out its burthen, and one of the stones broke a man's hip and the other part went about a man's face; he came up, and I washed him, and his face was full of powder.

10,789. Showing that it had not all exploded?—Yes, because there was no tamping on the hole.

10,790. Then do you think that the mere pressure of the powder with an oak stick would cause an explosion?—Yes, when struck with the mallet the cartridge being too large for the hole. If it had been only powder it would not have gone off. I think that in nine cases out of ten the accidents happen by the men forcing larger cartridges in holes than they are calculated for. In this instance the ground was exceedingly hard.

10,791. You are quite sure that the man did not use an iron tamping rod to force it in?—No; I took them to task the moment they came up. After I had washed and dressed the men, they told me, and I can reasonably believe them, that it was only wood.

10,831. You have said that you believe that the shot which you have mentioned went off from cramming in too large a cartridge with the swabbing stick?—Yes.

10,832. Do you think that possible?—I really think it is correct from what the men told me, after I had them up before they really knew what their hurt was; in fact I questioned them when they were down in the level.

10,833. Have you seen the cartridge ignited in a blast hole by the pressure of the stick?—Yes, when struck with the mallet. I have seen that in the bottom of a shaft sinking in ground at 18*l.* a fathom.

10,834. You speak with perfect confidence as to the correctness of that?—I saw that in Sithney Huel Metal about nine years ago.

10,835. Would it be possible to do that with a cartridge?—This was with a cartridge.

10,836. Could you show that experiment with a cartridge?—It could be done under ground, not on the surface.

10,837. Could you light a fuze between two stones alone?—No.

(J.)—POWDER.

(J.) *Powder.*

10,889. Are there many accidents from picking out the tamping?—No; they arise principally from boring it out.

10,890. Can you suggest any mode of preventing those?—The only thing that we have, and we find it very beneficial, is what we call a pricker, which is three-eighths iron, and the end turned, so as to loosen it, and then a scraper goes in and brings it out.

10,891. Is not that dangerous?—No, I never find any accident in picking out the hole with a picker, but where they bore it out, that is where an accident occurs; but I do not think that much of that is done now; men are cautioned against it I think by most agents.

Mr. Thomas Gill.

11,084. (*Chairman.*) What do you charge the miners for powder?—8*d.* a pound.

Capt. John Bargan.

11,172. (*Chairman.*) What do you charge for the powder?—I think it is 8*d.* a pound.

Capt. John Hancock and Mr. Michael Mercom.

11,296. (*Chairman.*) What are the men charged for the candles?—We charge the men 9*d.* a pound for them.

11,297. How much a pound do you charge for powder?—The same price.

Capt. John Prout Daw.

11,480. (*Chairman.*) And how much for powder?—8*d.*

Capt. John Taylor.

(J.) *Powder.*

11,551. (*Chairman.*) And how much for powder?—8*d.* a pound.

Capt. James Phillips.

11,733. (*Chairman.*) What charge do you make to the miners for powder?—We charge them 7*d.* a pound.

Capt. Zacharias Williams.

11,857. (*Chairman.*) What charge do you make for the powder?—The men do pay 50*s.* a hundredweight for the powder; that is 7*d.* a pound.

Mr. William Skewis.

11,987. (*Chairman.*) What is the charge that you make for the candles?—In Crelake we charge 9*d.* for powder and candles.

Mr. William Goddan.

12,087. (*Chairman.*) Is the powder small grained or large grained?—Large grained.

12,088. How much is charged to the men?—8*d.*

Mr. James Richards, Devon Great Consols Mine.

18,777. (*Chairman.*) And how much for powder?—8*d.*

Mr. James Hosking, Drake Walls Mine.

19,077. (*Chairman.*) And for powder?—8*d.*

Mr. William Gard, East Gunnislake, &c.

19,159. (*Chairman.*) And for powder how much?—6*d.*; but practically the adventurer pays for all that.

(K.)—CLUBS.

(K.) *Clubs.*

Capt. James Barkell.

954. (*Mr. Austin Bruce.*) How is he paid?—We charge for doctor and club 1*s.* 6*d.* a month; the doctor has 9*d.*, and for the 9*d.* he renders medical attendance to the man and his family.

Mr. Thomas Trevelyan.

1176. *Mr. Kendall.*) With regard to the club, what do you allow them per month, when they are ill?—1*s.* a day, hurt pay: 30*s.* per month.

1177. If they are consumptive, or anything of that kind, and have been with you a long time, what do you allow them?—We have no private fund for sickness.

1178. You confine it to accidents entirely?—What we term hurt pay.

1180. (*Mr. Kendall.*) What do you deduct per month for the doctor and club?—One shilling and sixpence.

Mr. John Pearce.

4011. (*Mr. Kendall.*) Do you mean kyanized—Yes; only in particular places where we should see that there was a tendency to fungous growths. I think that wooden air pipes are very bad for use in a damp state, for the wood absorbs a great deal of the air that has been driven into the mines. Then with regard to the miners' clubs, I have often observed when mines have been abandoned that the men who have been permanently injured there have had no means of getting their club money after the mines have been abandoned; notwithstanding that the mines may have produced a large sum of money which has been placed in these clubs, it has been taken by the purser or the secretary, or otherwise disposed of; and I would suggest that the money, when old mines are abandoned, should go into some general fund, and be disposed of for the benefit of those who have been permanently injured.

4012. (*Mr. Austin Bruce.*) Are the clubs usually registered under Mr. Tidd Pratt's Act?—No, none of them; and when a man is injured his means of support are cut off in that way, and they have to find other resources, and very often I believe they want, whereas if there was a general fund for mines, when suspended or abandoned, for the men to pay into, I think that the miners would be very much benefited.

Mr. Richard Quiller Couch.

(K.) *Clubs.*

6570. (*Chairman.*) Referring to the working of the clubs in the mines with which you are connected, is relief given in case only of accident, or in case of sickness also?—It is only given for external and visible hurts; that is the phrase which they employ.

6573. When a man is laid up suffering from miners' disease, does he receive no assistance?—I believe not.

6576. There is no regular provision made for a man if he is out of work?—No.

6577. Do you not think that such a provision would be very desirable?—Yes, most desirable.

6578. (*Mr. Kendall.*) You are aware that in every mine there is a club, and you have known many mines which have stopped. Do you think, upon the whole, that the club is a matter of profit to the men or to the adventurers?—I am afraid that it is to the adventurers in jobbing mines.

6579. Do you know of any case in which a mine has stopped working when the club money has been divided?—I know of a case in which a mine has stopped, when the club money and the doctor's money, a surgeon never having been appointed, have been thrown back among the parties to pay for a dinner that was given at the closing of the affair.

6580. I suppose it was a small amount?—No: it went pretty well to pay for most of the expenses.

6581. (*Mr. Davey.*) You do not know of any instance in which the club money has been divided among the men?—Never. But I have made no inquiries on the subject.

6582. (*Mr. Kendall.*) I suppose there would be very great difficulty when there was a balance in hand in fairly paying it back to the miners, as they are a shifting population?—Yes; but it might be distributed among the sick connected with the mine at the time of its stopping, or given to a general fund for the benefit of miners.

6583. (*Chairman.*) Would it not be desirable that the club money should be used in affording relief in case of sickness, and not only in the case of accident?—Yes. I think it should be applied in the case of all sickness, as a good deal of that arises from the nature of the occupation of the miners, and when that is the case, I think that the club money should be used in affording relief in the one case as well as in the other.

6584. (*Mr. Davey.*) Would you not require a much larger sum to do that?—No. There are some mines in this neighbourhood, which, so far as the club is concerned, are in a state of bankruptcy; but in others, I believe they have 400*l*. or 500*l*. in hand; and if the club was made a combined club the redundancy in the one would counterbalance the deficiency in the other.

Capt. Richard Boyns.

6747. (*Chairman.*) What is the amount of money that the men pay for club money?—One shilling. That includes the doctor and club; sixpence the doctor and sixpence the club.

6774. Is the club money only for visible accidents, or is it applicable for sickness in the mine?—It was started at the commencement as a sick and hurt club, and we found that the expenditure was more than the income; then we had to bring it back to a hurt club, and it is that now; it just meets its demands as near as possible.

6775. Do the men who are blinded receive anything from the hurt club?—Yes; and will as long as the mine is at work I expect, we have not thought of reducing their pay, or cutting it off.

6793. (*Mr. Kendall.*) You have mentioned about your own mine; from your experience, and from what you have heard, do you think that there is good faith kept with the miners, as far as the club money goes, by the adventurers and the pursers?—Yes, I have no doubt that it is kept correctly; our account has been kept separate from the beginning,

6796. As far as your experience goes, the money which is usually charged to the miner is not much more than enough to meet hurt cases?—No.

Capt. Thomas Trahair.

6955. (*Chairman.*) There is a deduction made from the men for what is called club money; will you state what that is?—To the dead club each man pays one 1*s*. for burial. If a man dies or is killed in the mine each one contributes 1*s*.

6956. Is that only if the man is killed in the mine?—If a man has died they must pay into that club.

6957. Is there any club fund for injuries?—Yes; there is a sick club to which they contribute 6*d*.

6965. Is there any account kept of the club money?—Yes.

6966. How often is it balanced?—Our account is balanced every month.

6967. Do the men know how it stands?—They can know every month if they like to ask for it, they can come to see; sometimes it will pay and sometimes it will not, and the purser advances the money if it will not pay.

6968. I suppose when it will not pay, it is because you have had more than the usual number of accidents?—Yes; there are more sometimes than at others, and then it will not pay. If we get a little money in hand, instead of giving them 15*s*. or 20*s*. a month, the injured men, we give them 25*s*. a month, so as to take off all the surplus money.

6969. You do not take into account the whole amount for a year, but you ascertain what the balance is every month?—Yes: we bring up the accounts every month.

6970. If there is a large balance at the end of a month, you increase the allowance?—Yes, that is our mode of dealing with it.

6971. If the balance was found to be smaller at the end of another month, would you diminish the allowance?—No.

6972. (*Mr. Kendall.*) There is a certain sum fixed which the men are sure to receive?—Yes.

6973. (*Mr. Kendall.*) And if there is a balance in favour of the club you increase the allowance?—Yes

6974. (*Chairman.*) And suppose the balance becomes smaller, you take off the additional allowance?—Yes.

6975. But you do not reduce the allowance below a fixed sum?—No.

6976. So that there never can be a larger accumulation?—No. It is considered that it is their money, and that they ought to have it.

Mr. Alfred Chenhalls.

7191. (*Chairman.*) With regard to the club money, is the same system adopted as to the club money in all the mines with which you are connected?—The clubs are differently established; the miners have recently taken upon themselves to conduct the clubs; they have insisted, by a sort of rise in one or two cases, upon having the control of their own moneys, and that the agents should no longer govern them, or the adventurers, in that respect. (K.) *Club*

7192. In which mine has that happened?—In Balleswidden and Boscean and Wheal Castle.

7193. What do the miners contribute to the club in those mines?—They contribute 1*s*.; I think it is 6*d*. each to the burial club, and the other 6*d* to the sick club or the hurt club.

Mr. John Nankervis.

7269. (*Chairman.*) Do you deduct so much a month from each man for club money to provide for accidents?—Yes.

7270. How much do you deduct per month?—6*d*. a month.

7271. Is that to provide for visible accidents?—Yes; that is divided between the parties who meet with visible accidents.

Mr. Stephen Harvey James.

7513. (*Chairman.*) How often is the account of the accident club balanced?—It is never balanced at all. The money is paid and the expenses are charged every month.

7514. Can you give us the amount now to the credit of the men?—There is neither debt nor credit. They are paid every month out of the club. No account is kept of it in any way. The adventurers pay them as they go along.

7515. They are paid if they meet with an accident?—They are paid if they meet with an accident; they are paid 5*s*. a week.

7516. For how long?—Until they get better.

7517. If a man is blind how long does he get the payment?—As long as he lives and the mine lasts.

7518. Five shillings a week?—Yes.

7519. Have you any distinct club fund?—We have no distinct club fund. I kept it for some time and I found that the club did not pay, and I thought that we had better turn it over.

7520. When you found that it did not pay I suppose you had had a number of accidents?—I think we had more at that time, that must be 15 years ago.

Capt. James Bennetts.

7735. (*Chairman.*) How much is the club money?—6*d*. per month.

7736. Is that accident club money?—Yes.

7737. Only for accidents?—For accidents, and occasionally sickness.

Mr. Samuel Higgs.

7891. (*Chairman.*) Is it only for visible hurts, or for sickness as well?—We have a rule in our mine that the purser and agents may grant relief, if in their opinion the funds of the club will admit, to any man who may fall sick from long labour in the mines, or from any casualty; we have that in our printed rules.

7892. (*Mr. Holland.*) That is a discretional payment?—Yes.

7893. (*Chairman.*) Is the balance of the club account made up every month?—Yes.

7894. Is a statement of it submitted to the adventurers?—The particulars of it are not submitted, but the books are always there, the cause of the payment from the club is recorded, whether it is for sickness or for hurt, and what kind of hurt it is; they sometimes take cold from exposure underground or on the surface, and if they have been long in the mine we consider them on sick pay.

7898. Do you know what amount it has ever been to any one set of adventurers?—I could tell in one or two mines where I have had the closing up, but I cannot tell from memory.

7899. Will you furnish that?—Yes.

7914. Would the purser's account of a mine show the total amount which has been paid to the club account for one year?—Yes; we make up our accounts quarterly, and it is shown every quarter.

7915. Could you furnish that?—Yes.

7968. (*Mr. Kendall.*) You have said that you give a man so much money for the first two years, after that how do you get on?—We continue to pay miners 30*s*. a month if the club will afford it and the man has a family, and we see that it is necessary. We never allow any of our men or their families to go to the union or

(K.)—CLUBS.

(K.) Clubs.

apply to the union for relief; we find that the club is quite sufficient.

7969. If a man has once received a hurt in your mine, you never allow him after that to go to the union?—Never.

7977. If you find that you are getting rich, do you go beyond the hurt money and go to illness, where you fancy that a man has become ill in the service of the mine?—Yes, we allow one pound a month. At this time at Providence mine, I think that we have only one person upon the club fund this last month, next month, perhaps, we may have two or three. I have found in all our mines that the club money is sufficient to provide for hurts and for sickness.

Capt. Richard James.

8399. (*Chairman.*) What do the men contribute to the club?—With us the girls pay 3*d*. for the doctor only: they are not entitled to the club. A boy earning below 20*s*. pays nothing; but if he is earning 20*s*. he pays 6*d*., and the men pay 1*s*. to the doctor and the club.

Mr. John Nancarrow.

8499. (*Chairman.*) What do the miners contribute to the club?—They pay 6*d*. a man per month.

8500. Do the surface men also pay?—Yes. The surface men pay to the club and to the doctor too; every man does.

8501. Do the women contribute anything?—No; they pay nothing.

Capt. Matthew Curnow.

8592. (*Chairman.*) What do the men contribute to the club?—6*d*. for club, and 6*d*. for doctor.

8593. The club money is to provide only for visible accidents, is it not?—Yes; if we know that a man falls and injures himself.

8594. It is not a club to provide for sickness?—No, unless a man is sick, and is laid up at any time, it is thought a kind of charity to support him from the club rather than that he should come to any place of charity else.

8595. Is any account kept of the club money?—Yes, but our purser keeps it; we have not got it opened in our books.

8614. You consider the club money to belong to the miners?—Yes, if the men were to turn out, and were to say, What is to become of our club money? we should say we have the money as support money.

8615. But who looks after it?—The books would get overhauled.

8616. Does the purser present any account to the men?—No, I never heard that broached to the purser at all.

8617. Then you would not know how the account stood?—I heard a little while ago a fellow agent say to a purser, "I suppose our fund is pretty stocky," and he said "It is right enough yet." I suppose we must have the money, but it would be better to have an account rendered to the men, although it is not the general rule in the mine.

Capt. Charles Thomas.

8777. (*Chairman.*) What do the men pay for club money?—In some mines they pay 6*d*. and in others 9*d*. a month.

8778. In Dolcoath how much do they pay?—9*d*. now; it was 6*d*. for seven years, until about a year ago, 6*d*. was not found quite sufficient to pay all the demands upon the club, and then we charged the men with 9*d*. for a time; and as soon as we have got a little accumulation, so as to be able to carry on the working of the club, we shall fall back to 6*d*. again.

8779. Did the deficiency arise in consequence of the occurrence of accidents?—Partly from that, and some widows who had been on the club for some time, some of them for 10 years.

8780. Is the club money used only for visible accidents?—They have no legal claim according to rule, except there is a visible wound.

8781. In the case of the widows to whom you have just referred, did they become widows in consequence of their husbands losing their lives by accidents?—Some of them only. Others had died after a very long service in the mine, worn out, they had been working in the mine for perhaps 20 or 30 years, and in those cases the widow receives some allowance for a year or two; we have had one for seven or eight years receiving three shillings a month.

(K.) C

8787. In the Dolcoath mine, where you had to raise the contribution of the men from 6*d*. to 9*d*., had the men no account shown to them to explain why you were obliged to do so?—No.

8874. Have you ever known an instance in which the adventurers have paid money on account of the club when all the funds of the club had been used up?—I have heard of that, but it has not come under my own immediate observation.

8875. When your club got into debt you increased the contributions of the men?—Yes, we advanced the money from the general funds of the Company for that time; but we raised the pay from the men from 6*d*. to 9*d*.

Capt. Thomas Richards.

8922. (*Chairman.*) What do the miners pay for club money?—Sixpence per man per month.

8923. Is that money paid only to provide relief in case of the miners receiving hurts?—That is for the club money; we do not understand anything but club money.

8931. What allowance is made to a man who has met with an accident?—Thirty shillings per month, and in the case of death we give 10*l*., and the funeral expenses out of the club if it is rich; we always give the 10*l*.

8932. You give that to the widow, and pay the funeral expenses if the club is rich?—Yes.

Capt. Joseph Vivian, North Rosskear.

9049. (*Chairman.*) How are the fees which are paid to the school charged against the adventurers?—The club is deducted from the men the same as any other material with which they are supplied. It does not appear before the adventurers as a charge. The charge is for breaking a certain quantity of ore, or for excavating a number of fathoms of ground, amounting to a certain sum of money. The men's materials, powder, candles, clay, nails, and the various other things are furnished, and club and doctor. They pay 6*d*. to the doctor as well as to the club. Then the doctor takes them on all occasions. Formerly it was found by the surgeon that not only wounded men called upon them, but that men called upon them for colds, sprains, and one thing and another, and 15 or 20 years ago we altered the amount from 3*d*. a month to 6*d*. in order that the doctor should attend on all occasions.

9050. From what fund does the money come for the children who are sent to school?—That is conducted in the club account. We will suppose that so many people may have been wounded, and so much money paid, and we finish with the school charge. We deduct 6*d*. for club, and 6*d*. for doctor, amounting to 1*s*. a man.

Mr. R. H. Pike.

9185. (*Chairman.*) What has been the largest amount of it in winding up the mine, in any mine that you have been connected with?—In any mine that I have been connected with it has always been very irregular, because I have always recommended liberality. In the Carn Brea mines, which are the most extensive mines in Cornwall, the club fund several times has 100*l*. in hand, but it is more frequently 50*l*. or 100*l*. in debt.

9186. Does that arise from there being more accidents, or from your applying that club money otherwise than to visible hurts?—We apply it to pensioning off old men who are unable to work any longer on the mine, who have been there for many years and their money is spent; we always make them some allowance, and we are not particular about the injury or the illness which is occasioned by the nature of their work, we treat an illness occasioned by working in the mine as a visible hurt. Then, again, out of the club fund we bury the men; if a man dies from an ordinary illness, not at all connected with his duty in the mine, we always pay for the coffin; any man working in the mine has his coffin from the mine, and that is always charged to the club at Carn Brea.

9187. Is any allowance ever given to the widow?—Yes; we generally allow 10*l*., and sometimes more, never less than 10*l*.

9188. That is from the club money?—Yes.

(K.)—CLUBS.

Capt. William Teague.

9372. (*Chairman.*) What is your rule as to club money, is it for visible accidents?—Yes.

9373. What is the amount of club money that the men pay?—6*d* a head per month.

9374. Is there a separate account kept of the club money?—No

9375. I suppose that any balance of the club money in case the mine was wound up, would be considered as belonging to the adventurers?—Yes

9376. (*Mr. Holland.*) Do the payment by the men and the payment to the men about balance?—No, the the men are in debt very much.

9377. (*Chairman.*) Then you do keep an account?—Yes, we cannot run it out without keeping an account, but there is no separate account. If we have five men on the club, those five men are charged as an engine would be charged; we pay Tom, Dick, or Harry so much a month, whatever claim they have upon the club There is no club account kept, but we can look at the books at any time, because our doctor's account is exactly the same as the club account; they are in equal sums. The doctors are paid their pence, and the club is so much, but it is not carried to account; it is made the adventurer's account.

Mr. John Richards.

9552. (*Chairman.*) What amount do they contribute for club money?—Each man contributes sixpence per month.

9553. Is that to provide for visible accidents?—Yes, for visible accidents, or if they have been hurt by long continual working in the mine they are paid the club. If a man comes to perhaps fifty years of age, then we pay him the same as we pay to a man that is hurt if we have reason to think that he came by the illness there.

9554. What allowance do you make to them?—25*s.* a month.

9555. Is there any account kept of the club-money separately from other account?—Yes.

Mr. Joseph Jewell.

9676. (*Chairman.*) What amount do the men pay as club-money?—1*s.* per month for doctor and club.

9677. Is the club-money applied in cases of visible accidents?—Yes.

9678. Is there a separate account kept of the club-money?—Yes

Capt. James Pope.

9925. (*Chairman*) What club-money do they pay?—6d. a man.

9926. Is that club money for visible hurt or for sickness?—For visible hurt

9928. Is a separate account kept of the club money?—Yes.

Capt. Joseph Cock.

10,026. (*Chairman.*) What club money do they pay?—One shilling a month; that is for doctor and club.

10,027. Are you aware whether there is any separate account kept of the club money?—Yes; there is.

Capt. William Rutter.

10,116. (*Chairman.*) With regard to the club money, what amount do the men pay for club money?—First of all, when we commenced with East Crofty, the men paid 8*d.* in the pound; that is to say, if they got 3*l.* per month, they paid 2*s.*, and the merchants gave us a penny in the pound on their bills. After a while we found that we were accumulating very fast, though we were very liberal in club matters, and we reduced it to 6*d.*

10,117. Is the club money confined to visible hurts?—Never in any case with us. The rule says that it must be a visible hurt, but we have always slipped over it as a matter of philanthropy, and we have relieved men when they have been home with severe colds and so on, and have continued to do it all the way throughout. After a while we found 6*d.* too much, and we reduced it to 4*d.* Since then the merchants have declined paying us anything, but we can do very well with 4*d.*

10,118. What allowances do you make to the men? Have you any fixed allowances?—For what we call working pay, if a man is slightly hurt we give him 14*s.* per month, 6*d.* per day. For sick pay we give him 1*l.* 8*s.* per month. If he has a broken leg, for example, we pay for persons watching him, and bandages, and anything that he wants. If he wants a bed or a mattress, or anything of that sort, we have always given it. We have been able to be liberal with the club, and we have done so.

(K.) *Clubs.*

10,119. In case of a man being off work for some time, do you continue to make him an allowance?—Yes; we have had men home for years, who have been fairly worn out in the mine, because miners do not live to be very old. I have stood upon the hill, just where we cross North and South Crofty, many times, to look at the faces of the miners as they came up, and you will see very few old men; it has been sometimes complained of when men have had what we call a holiday. I have said you cannot err much in that. When I heard people complaining of a Whit-Monday or Whit-Tuesday, which are holidays with us, and that they do more harm than good, I have not thought so. With all their holidays, they die off very early, prematurely. If you stand at any place in the mining district, and look at the men as they pass by, you will find very few old men.

10,120. With regard to the club money, is the 4*d.* in the pound charged to men even with small gettings? What limit have you?—It goes in the same ratio whether it is 1*l.*, 2*l.*, 3*l.*, 4*l.*, or 100*l.*; it is 4*d.* in the pound. If they get a start, and a man gets 100*l.* (and they have got that sometimes), they pay the same poundage, because they can then afford it very well.

10,121. Does a man who only gets his pound or 30*s.* in a month pay?—Yes; we would rather for him to pay if we gave him a few shillings out of the club afterwards.

10,122. So as to keep up the rule?—Yes.

10,123. Do you consider that 4*d.* in the pound would be sufficient, without the contribution from the tradesmen to maintain the club in the way in which you manage it?—It will do very well for all accidents as far as my experience goes. It would not do to continue on a sick list to every miner, perhaps, but it is done with us, generally speaking We never turn our backs upon a poor old sick man.

10,124. It must depend very much upon the number of accidents how far the club money will go?—Yes. Sometimes we find that they are more frequent than at other times, but recently, since we have had a fuse and so on, the accidents have not been so many as they were.

10,125. In other mines they pay 6*d.* per month, and in some instances 9*d.* for club money. What proportion would your plan bear to that?—I think that our plan is about 1*s.* per month, averaging it. It is not less than 1*s.*, I should say, but it enables us to step over the bounds of accident We have sometimes given as much as 5*l.* for a person who has had a defect in his breath, and sent him to Truro, to Dr Bullmore, or some one else. We could not do that if we were screwed down too tightly.

10,126. You think that with the 1*s.* a month that enables you to relieve sickness as well as hurts?—Yes, in special cases.

10,127. You prefer the plan of 4*d.* in the pound, being in proportion to the earnings of the men, to making a general 1*s.* per month?—The great advantage of the poundage is simply this, that if a man should be successful, and get 20*l.*, 30*l.*, 40*l.*, 50*l.*, 60*l.*, 70*l.*, or 100*l.*, he can then afford to help us; it raises the funds

10,134. What amount of club money have you ever had accumulated?—When it was East Crofty we had as much as 2,000*l.* once in Mr. Tweedy's bank, but we have always from the beginning kept a separate account.

10,137. I suppose that that is the only time when they have done it?—Yes. As long as I have had the management I have always taken care not to deduct more from the men than would about do, just to keep about 20*l.* balance; that is enough. There is one thing which we have always found in the case of a failure of accounts, we have always found the men willing to put on a penny or twopence in the pound for a little while till we raised the fund again.

10,138. Then in that case you would communicate to the men the state of that account?—Yes. I should say to the men at once, Our club is exhausted; will you consent to pay up 2*d.* in the pound to make it 6*d.* for a little while? If so, hold up your hands; and they do it with a great deal of pleasure.

(K.) *Clubs.*

10,139. You think it very important that a separate account should be kept?—Decidedly. Our account is kept as distinct as possible.

10,140. Is that account laid before the adventurers?—Yes, every two months; at every account meeting

10,141. You are of opinion that this money belongs to the men, and not to the adventurers?—Most decidedly, I should say. The adventurers are merely trustees on behalf of the men.

10,201. (*Mr. Kendall.*) When men take, they make their calculations; if they have to pay 8*d.* in the pound, or if they have to pay 4*d.* in the pound, they act accordingly?—I do not know about that. I do not suppose that that comes much into their calculations, because the object of 8*d.* or 4*d.* in a month is not much; they suppose that it may be wanted for the club, and therefore they do not grumble about it.

George Smith Esq., LL.D.

10,257. (*Chairman.*) Is this money ever applied to purposes connected with the mine?—Yes; I have sat at a mine board myself, and seen 300*l.* or 400*l.* balance of the money in the club appropriated to pay merchants' bills.

10,258. Did you concur in that?—I demurred to it, certainly, but I was met by the answer, "What are "you to do with it? You cannot divide it among "the men, and the men who are now working in the "mine have not been the contributors to it any more "than those who worked in the mine many years ago."

Capt. Joseph Vivian, Huel Fortune.

10,723. (*Chairman.*) What deduction is made for club money?—6*d.* for club and 6*d.* for the doctor.

10,724-5. Is the club for visible accident only?—Yes.

10,726. (*Mr. Holland.*) Is there no allowance for sickness?—No.

Capt. William Chappell.

10,817. (*Chairman.*) Do you know what the men pay for club money?—They pay 6*d.* a month.

10,820. Do you consider that the club money belongs to the men or to the adventurers?—To the men.

13,821. Have the men any means of knowing the state of that account?—Yes, at any time, if they ask. There is a debtor and creditor account kept regularly.

10,822. You think that that money should not be applied to the other purposes of the mine?—To no other purposes.

Mr. Thomas Gill.

11,090. (*Chairman.*) Is there a separate account kept of the club money?—Yes.

11,091. Do you consider that the club money belongs to the miners or to the adventurers?—I think it belongs to the men, although a great many men do pay the club money that is indebted to the mine; they pay it as it were towards the club for a year, having been indebted to the mine.

11,092. Supposing that a mine was stopped, and you had to dispose of any balance of club money, what should you say would be the fair way of disposing of it?—I should think that the money ought to be divided between the invalids of the mine.

11,093. (*Mr. Holland.*) Whatever the amount might be?—Yes, because if the men should pay 6*d.* a month, and that should amount to more than what was drawn from the club, their pay should be raised at the time of a serious accident.

11,094. (*Chairman.*) Who would have to provide the money in case the club money was not sufficient?—Then it would fall upon the adventurers; but that is a thing that I took pretty good precaution about when I went to Wheal Vor, because our outgoing was more than the incoming, and that should be looked to soon.

11,095. Would you increase the contribution made by the men for club money in order to meet any deficiency, or should the adventurers meet it?—The adventurers should advance it for a time, if it was a serious accident; when eight or ten men meet with an accident. At the same time, if you should run down the club, the adventurers should stand by it, but then the men should make it good again afterwards; it should not come upon the adventurers—not permanently.

Capt. John Hancock and Mr. Michael Morcom.

(K.) *Clubs.*

11,301. (*Chairman.*) How much is charged for club and doctor?—Sixpence a month for the club, and sixpence for the doctor.

11,302. Do you keep a separate account of the club money?—Yes; quite distinct.

11,303. Is a statement of that account rendered to the adventurers with the other accounts?—No; not exactly to the adventurers, but to our managers in London.

11,304. The club money is for visible hurts, I presume?—Yes.

Capt. John Prout Daw.

11,470. (*Chairman.*) What do the men pay for club money?—6*d.* a month.

11,471. Is a separate account kept?—Yes.

11,472. Have you seen that account?—Yes.

11,473. Do you know about how much is on the account now?—I think that we have something like 40*l.* on the account now to the good of the club.

Capt. James Phillips.

11,736. (*Chairman.*) Do they pay 9*d.* for the club, and 9*d.* for the doctor?—Yes.

11,737. How much is put down to be deducted for club money?—1*s.* 6*d.* a man.

11,738. That is for the club and the doctor?—Yes; that sum is deducted out of a man's balance, for club and doctor.

11,739. Is any account kept of the club money separate from the doctor?—None.

Capt. Zacharias Williams.

11,858. (*Chairman.*) Do the miners contribute any club money?—Yes.

11,859. Is that to provide for visible hurts or for sickness?—Our club men pay 1*s.* 6*d.* a month, that is 7*d.* for the doctor and 9*d.* for the sick.

11,860. Does "sick" mean for visible hurts?—Yes, it is, should they be sick and hurt; but in addition to the fund they got 1*l.* sterling per month. If they are hurt they get 20*s.* a month; if sick they receive only 15*s.*; if they are hurt as well then they have 35*s.* a month. It is added together, the sick and the hurt pay.

11,861. Is there a separate account kept of the club money and of the doctor's money?—Yes.

11,362. As between the club and the doctor?—Yes.

11,863. There is a distinct and separate account kept of the club money?—Yes.

11,864. Is that account of the club money rendered to the adventurers?—No; that is always kept as the separate account of the men; that is all they can claim in a certain sense, but we have been for years, so that we have paid 3*l.*, and 4*l.*, or 5*l.*, a month more than the sick money would provide. We have had so many men worn out—men lying on the club—that it would take more money than the monthly contributions of the men would provide.

11,865. How is that additional sum entered in your accounts?—It is stated in the account what is it for, as loss on the sick fund.

11,866. (*Mr. Kendall.*) Is it entered as a debt due from the club?—No; it is charged to the adventurers.

11,867. But still you keep a separate account?—Yes, of everything.

11,868. (*Chairman.*) How is that charge entered?—It is entered as sick pay.

11,869. Do you know from your own personal knowledge how far the club fund has been insufficient to provide the allowances which you have been in the habit of making to the miners when sick, or when suffering from hurts?—No, not precisely so; but, perhaps, sometimes 3*l.*, sometimes 4*l.*, and sometimes 5*l.* a month it will run to; it depends upon the number of hands. There may be old men; and our men receive 15*s.* a month regularly. We have had many here in Tavistock for years. They amount to 4*l.* or 5*l.* a month. See last question, for many years, say 20 years, the club contributions have not paid the claims.

18,870-2. Do you remember when there was a balance of club money in favour of the men?—No; for several years the club was going in debt, and I have heard that 500*l.* or 600*l.* was at one time charged to the mine, before the monthly deficits were charged as they occurred.

11,873. Is that now all exhausted?—Yes, and many scores of pounds more than that. See above.

(K.)—CLUBS.

Clubs.

11,874. (*Chairman.*) Has it become exhausted in consequence of the miners being off, or from old age, or from accidents?—Some of both; but we rarely have an accident, I am very glad to say.

Mr. WILLIAM SKEWIS.

11,988. (*Chairman.*) What is the charge made for club money?—9*d.* per man for doctor and 9*d.* for club.

Mr. WILLIAM GODDAN.

12,089. (*Chairman.*) What is the amount paid for club money?—9*d.* club and 9*d.* doctor; 1*s.* 6*d.* a month.

12,090. Is club money for visible hurt or for sickness?—We allow no sick pay, only for visible hurt.

12,091. Do you keep a separate account of the club-money?—Yes.

Mr. JOSEPH MATTHEWS.

18,890. (*Chairman.*) Is it for visible hurt, or does it include sickness?—We have a sick fund to which the men contribute; in case of hurt they are paid by the mine in addition.

18,891. Does the money which the men contribute go to the sick fund?—Yes.

18,892. Does a part of it go to the club fund?—No; in case of hurt it is paid entirely by the mine.

18,893. Does the attendance on the sick include their families, or only the men?—The men and their families, till they go to some work.

Mr. JAMES HOSKING, Drake Walls Mine.

19,079. (*Chairman.*) How are the doctors paid?—Every man subscribes 15*d.* a month for doctor and club.

19,080. Is the club merely for visible hurt or for sickness?—For hurt, not for sickness.

19,081. How much does the doctor get out of the 15*d.*?—9*d.*

19,082. And the rest is for the men in case of injury?—Yes, in case of an accident.

Mr. WILLIAM GARD, East Gunnislake, &c.

19,164. (*Chairman.*) What is the deduction for the doctor?—9*d.*; we charge 1*s.* 6*d.* We do not allow any sick pay, for this reason, that very often in a mine old men come in whose constitutions are broken before they come there; they get laid up, and there is so much taken taken away from the fund which would otherwise go towards the man who is hurt, and who then requires everything that you can give him, therefore we prefer accumulating a large fund for a man who is hurt; and they all of them have their own sick clubs. I take it that if we allowed sick pay, in fairness to the men, we ought to have every man medically examined before coming into the mine; a young man would have to pay to the support of an old man. If you have a given number of men there must be a given sum subscribed.

19,165. They have sick clubs among themselves?—Invariably. As a general rule I think that there is no miner but who pays to a club beside his mine club. I think that at all events 75 per cent. pay to clubs besides their mine clubs.

Mr. JOSEPH PHILLIPS NICOLLS, Frank Mills and South Exmouth Mines.

19,503. (*Chairman.*) Do the man pay club money and doctor?—Yes, the miners; but the surface men do not pay club, but only doctor.

19,504. How much do the men pay?—9*d.* a month for doctor and 9*d.* for club. The boys and girls pay 3*d.*

19,505. Is the club money for visible hurt, or sickness?—For visible hurt. A great many of the men are in the parish clubs, and if they are sick and receiving pay from both clubs they get more than if they are working. We are continually giving; in any case which we think deserving we help them.

19,506. Is there a separate account kept of the club money?—Yes. We give them gratuities; at the last pay day we paid 6*l.* to the men that were sick; but they cannot claim it. The boys and girls have nothing to do with the club; the 3*d.* is for the doctor. The doctor attends them for everything and also the underground men.

(*a.*)—APPROPRIATION OF CLUB MONEY BY ADVENTURERS.

(K. *a.*) *Appropriation of Money by Adventurers.*

Mr. SAMUEL HIGGS.

7895. (*Chairman.*) To whom is it considered that the club money belongs, to the adventurers or to the men?—If the mine stops, the balance of the club belongs to the adventurers.

7896. And they would be justified in dividing it?—In adding it to the assets.

7897. Has that ever been done?—Invariably, so far as I know, in this neighbourhood.

7898. Do you know what amount it has ever been to any one set of adventurers?—I could tell in one or two mines where I have had the closing up, but I cannot tell from memory.

7901. (*Mr. Kendall.*) Have you ever known a considerable balance?—There was a case, I think, of Huel Prudence, in St. Agnes, which stopped a few years ago, and the men claimed a balance of club money, and I think the case was tried at Hayle.

7902. (*Chairman.*) How was it decided?—That it belonged to the adventurers.

7903. Do you remember the amount in dispute?—No. I could furnish it.

7904. (*Mr. St. Aubyn.*) Before whom was it tried, was it in the County Court?—No, it was tried before the Vice Warden or the Registrar.

7905. (*Chairman.*) Can you give the date of that case?—It was perhaps 12 or 14 years ago; that is the only disputed case which I have known.

7909. (*Mr. Kendall.*) How long has that mine been worked?—Nearly 30 years. To show that we treat it as the adventurer's fund, 12 or 14 years ago our mine was very poor, and the hands much reduced, we then had 260*l.* in the club, and we transferred 100*l.* to the credit of the adventurers.

7993. (*Mr Davey.*) Supposing that the Providence mines cease to work to-morrow, and that you had two or three claimants upon the club, and you paid them off, what would you do with the balance?—We should divide it among the adventurers; we should use it as an asset.

Capt. CHARLES THOMAS.

8783. (*Chairman.*) Do you consider the club money to belong to the adventurers or to the men?—There is a difference of opinion about that. I believe that the adventurers generally claim it as their own if a mine is shut up.

8784. Do you know of any case in which, where a mine has been shut up, the club money has been applied as part of the assets of the mine?—There was a little mine, and at the close of it there was about 30*l.* in hand. I had the management of it; there were two or three persons on the club, and we made a present to them of something considerable; I do not remember what, but we thought it just sufficient to meet their case if they had continued to work in the mine. After that there was still a balance left of, perhaps, 25*l.*, and I said to the adventurers: "I do not consider that you have a "positive claim upon this, and the way in which I "intend to appropriate it is this:—I will not charge "any wages for myself, nor for the agents on the mine, "for closing up and selling the materials, and winding "up all the accounts, and unless you say that I shall "not do it, I shall take this money and pay myself, and "pay my agents out of club money instead of handing "it over to you. I do not consider that you have a "positive right to it." That is now 10 years ago, and since that time the sentiment has turned round in favour of the adventurers, and they say that it is their money now; but that did not exist then, and if I were in the same circumstances now it is not likely that they would let me take that course.

8785. Has any case occurred lately that has been referred to arbitration in which there was a considerable amount of club money?—There was something about the Camborne Vean mine. I do not recollect the circumstances, but I think that that was referred to arbitration.

Mr. ROBERT HART PIKE.

9182. (*Chairman.*) Is that looked upon as an account for the men, for an account of the adventurers?—It is looked upon and always treated, I think, as belonging to the adventurers, on the occasion of a mine being abandoned when the club fund ceases to be held.

(K.)—CLUBS.

(K. a.) Appropriation of Club Money by Adventurers.

9183. And it is regarded as assets of the adventurers?—Yes

9184 Has that ever been disputed?—No; I never heard of a dispute. There have been frequent cases of winding up mines, and the money has been treated as an asset of the mine.

Capt. James Pope.

9929. (*Chairman.*) Do you consider that club money in case the mine was stopped to belong to the adventurers?—Yes.

9930. (*Mr Kendall.*) Why?—In case more accidents occur than the club is sufficient to pay, the adventurers advance money and pay for them, and if there is any little balance in hand I think that they ought to receive it.

Capt. William Rutter.

10,135. (*Chairman.*) What became of that money?—I am very sorry to say that the adventurers devoted some of it to working the mine afterwards. I told the purser there and then, tooth and nail, that they were taking the blood and bones of the men,

10,136. Then you as manager protested against it?—I did. I was not the manager of the mine at the time, but I could not help opposing it. I thought we should not have done it, I would rather have put 1,000*l*. of it to raise an hospital, as we were trying to do at one time.

10,207. (*Mr. Kendall.*) When a part of the 2,000*l*. balance in that club money was expended, and you thought it right to remonstrate, did the men themselves make any remark on it?—They did not like to grumble about it; they did not bring any thing forward specially.

10,208. Was there a feeling of discontent among the men in consequence?—Yes, the men did not like it; I am bound to say that.

Mr. John Burgan.

11,176. (*Chairman.*) Do you know what the amount of the club money is?—I do not know, it is a regular company's account, it is not a purser's account nor a club account exactly; it is entirely a company's account, and everything is carried to the credit of the company, as any other matter of business. There will be no difficulty whatever

11,177. Should the mine stop, would the company then divide it?—Yes; and if it was not sufficient it would be provided without any deduction whatever from the miners. The whole of the money in our mine very nearly is in stock, as far as the club money goes, and that is why we have paid none.

Capt John Hancock and Mr. Michael Morcom.

11,305. (*Chairman.*) Do you consider that as belonging to the men or to the adventurers?—To the adventurers.

11,306 Have you a large sum at the credit of the club account?—Yes. At the present moment we have somewhere about 700*l*

11,307. And the adventurers, according to your opinion, would be entitled to apply that money to any purpose in the mine?—Decidedly; for this reason. Many years ago I was in Gwennap, and we had a great many accidents, and every now and then we had to charge to the cost book 50*l* deficiency in the club, and therefore it must belong to the adventurers.

11,308 But I suppose that that was made up again?—Never. That was done repeatedly.

11,309. That is not your case?—No.

11,310. Therefore you have not so many accidents as they had at Gwennap?—I never knew less accidents than we had at Polberro.

11,311. And therefore your fund accumulates?—Yes.

11,312. Of course a large charge coming against the club shows that there must be a good many accidents?—Yes.

Capt. John Taylor.

11,549. (*Chairman.*) Do you consider the club money as belonging to the adventurers or to the men?—We consider it as belonging to the adventurers.

(*b.*)—PROVISION IN CASE OF SICKNESS.

(K. b. [illegible] Sickness

Mr. James Barkell.

963. (*Chairman.*) Am I to understand that the 4*s*. 6*d*. is allowed to them for any casual sickness not connected with working in the mine?—If a man was sick from any other cause, if he had not been working in our mine more than a week, he would have 4*s*. 6*d*. a week and medical attendance as long as the mine worked.

964. (*Mr. Austin Bruce.*) Do you pay him out of the fund, or are you responsible to him for 4*s*. 6*d*. a week?—It would be charged in the cost of the mine. I do not keep the books. I do not know how the funds of the doctor and club would stand, but I know that I should charge that money.

A Miner. (No. 1.)

2860 (*Mr. Austin Bruce.*) When you were off your work, did you receive anything from the club?—No, I never received anything from the club in my life

2861. They do at some pits, do they not?—Not for sick pay, unless it is at St. Blazey, under Squire Trefry, we have sick pay there; but in other mines I never heard of sick pay except for accident

2862. You had your medicines?—Yes

2863 But nothing else?—Nothing else.

2864 How long have you ever been ill at a time?—Four months.

Mr. James Richard Quick.

6645. (*Chairman.*) If he is suffering from bronchitis, or from miners' disease, does he receive any assistance then?—If completely disabled by disease or infirmity they are generally provided for in the large mines, and always so, in all mines, if disabled by an injury. A great number of them are members of benefit societies, and receive pay from them whenever lawfully disabled.

6646. Otherwise there is no provision, I suppose, but the union for a man who is ill?—I do not know that they have any means provided for them, and unless they have some of their own they must have parish relief

6647. As a patient, I presume you would think it desirable that a miner should have good food while under treatment?—Yes.

6648. But there is no provision of that kind for them?—If a man meet with an accident he is allowed a certain sum monthly during the time he is disabled, if sick he has weekly pay from his sick club.

Capt. Richard James

8401 (*Chairman.*) Do you balance the account every year?—I really do not know; that is the purser's business. All we do if any man is injured or sick is this, if that man is injured or is ill so many days, for every day he gets 1*s*., and the purser keeps an account of it

8402. If a man were sick would he receive anything?—Yes, we have a clause in our rules that a man, unless he should show a visible hurt, has no real claim, but it is left to the discretion of the purser and the agent. and if a man is taken ill we allow him as much as the circumstances may enable us to allow. If he dies we bury him, and support his widow, or contribute to the support of his children afterwards.

Mr. William Skewis.

11,989. (*Chairman.*) Is the club money for the relief of miners who are suffering from visible hurts, or for sickness?—For visible hurts. We do not allow any sick-pay in our mines.

(L.)—DOCTORS.

(L.) *Doctors.*

Mr. James Barkell.

954. (*Mr. Austin Bruce.*) How is he paid?—We charge for doctor and club 1s. 6*d.* a month; the doctor has 9*d.*, and for the 9*d* he renders medical attendance to the man and his family.

Mr. Thomas Trevelyan.

1180. (*Mr. Kendall.*) What do you deduct per month for the doctor and club?—One shilling and sixpence.

A Miner.

1859. (*Chairman.*) Did the doctor attend you during that time?—Yes; but still we derive a very considerable inconvenience frequently from paying the doctors in that way.

1860. Why?—We frequently think that they do not pay sufficient attention to us as they otherwise would do, provided it was managed in some other way; it is frequently complained of. During the former part of my illness the mine doctor attended me; but after some time I did not recover perhaps as fast as he could have desired, and I had to apply to another. I had to go to Plymouth to the physicians there.

Capt. John Truran.

6406. (*Mr. Kendall.*) What do the medical men say upon that point, or have you brought it under their notice?—Yes, it has been mentioned to them; but they have never been underground; we mentioned it to Mr. Bolitho.

Mr. Richard Quiller Couch.

6461. (*Mr. Kendall.*) You have been, I believe, underground a great deal?—Yes, very frequently, and I find that the men are better taken care of than I was led at first to expect.

Mr. John Richard Quick.

6640. (*Chairman.*) Have you been down many of the mines?—No; I was down once only.

Capt. Richard Boyns.

6792. (*Mr Kendall.*) For that the doctor is obliged to attend the miner's family, is he not?—Yes.

Capt. Thomas Trahair.

6959. (*Chairman.*) How much is paid for the doctor?—9*d.*

6960. Does the doctor attend the family of the miner, or only the miner, or only the miner himself?—He attends to the whole family.

Mr. John Nankervis.

7272. (*Chairman.*) How much is contributed for the doctor?—6*d.*

7273. Does that contribution include attendance only upon the miner himself, or also upon his family?—It includes attendance upon himself and his family, except in case of fever, and for the midwife.

Capt. James Bennetts.

7733. (*Chairman.*) How much is the doctor's fee that the men have to pay?—6*d.* a man per month.

Mr. Samuel Higgs.

7884. (*Chairman.*) Can you state the amount which is deducted for the doctor's fee?—In one of our mines we deduct fourpence in the pound for doctor and club.

7885. Which mine is that?—That is in the Providence mine.

7890. The parties who do not earn 1*l.* are not charged?—They are not charged with the doctor or club.

7917. Will you state your reasons for adopting the plan which you have mentioned of the men paying a per-centage from their earnings instead of a fixed sum per month?—I found that the Providence mine was very bunchy, and that the tributors would go on sometimes for three, four, or six months, and would get scarcely anything, and they then received a very small subsist, but yet their cost was always charged for the doctor and the club, and it went as a debt against the men, but it was paid by the adventurers; and when the men got a start of 20*l.* or 30*l.* a man they were only charged 1s. for doctor and club. Now, the average earnings of the tributers are a little over 3*l.*, and the 4*d.* comes in regularly, and it is no loss to the adventurers; we do not lose by paying the doctor or the club out of the adventurers' funds instead of the miners.

7920. It is not remitted?—No; it always stands against them, but we do not claim the debt unless they can afford to pay it out of their wages. We must allow miners to get a sufficiency to maintain themselves. If they are unsuccessful for months we grant them a subsist, and on that subsist we do not charge the doctor and club. When they get a start, if they get a 40*l.* start, they have 40*s.* to pay to the doctor and club.

7923. Then the doctor's income varies according to the men's earnings?—Yes; but if you make up the men's cost it comes to pretty nearly the same.

Mr. George William Bevan.

8220. (*Chairman.*) Do you keep any record of the cases that come before you?—No, not all.

8231. You have kept no record at all of the number?—Not at all; it would be interfering with the other business.

8253. Is that in consequence of their not being satisfied with the medical treatment they have received?—Not at all; it is perhaps from my being nearer—perhaps they might not be near to reach their medical attendant—they might work in a mine from which he might be four or five miles off.

8254. In a case where the medical attendant resides four or five miles away, how often does he visit a mine?—Not at all, unless he is called upon.

8255. Then have the men to go that distance to him?—Yes, sometimes they have; and if they are not capable of going the medical attendant attends them at their own house; in case of fever or accident they are particularly attended to.

Capt. Richard James.

8399. (*Chairman.*) What do the men contribute to the club?—With us the girls pay 3*d.* for the doctor only; they are not entitled to the club. A boy earning below 20*s.* pays nothing; but if he is earning 20*s.* he pays 6*d.*, and the men pay 1*s.* to the doctor and the club.

Mr. John Nancarrow.

8502. (*Chairman.*) What do the men pay to the doctor?—6*d.*

Capt. Matthew Curnow.

8607. (*Chairman.*) Have you one doctor or two at your mine?—We have two doctors.

8608. By whom are they appointed?—By the men; that has been so for some years gone by, and that still stands.

8609. In your opinion is that a good plan?—Yes, it is more pleasing to the men.

8610. Is that the general practice?—No, there is a little more interest taken in that in our county in places.

8611. I suppose the doctors are generally chosen by a canvass?—Yes; I have attended meetings where, in putting on mines we have taken up shares to carry on a mine, and that has been canvassed before the adventurers and carried there, and then the labouring men must take whoever is fixed on to attend them; but ours was carried by a majority of the men.

8612. I suppose the same principle could be pursued in case there was a change of doctors?—Yes.

8613. Do you think that that is a better system than that the doctors should be appointed by the adventurers?—Yes, a great deal better.

Capt. Charles Thomas.

8789. (*Chairman.*) How much do the men contribute to the doctor?—6*d.*

8790. How are the doctors appointed?—They are appointed by the adventurers always. The men have no voice in that.

8791. Is it your opinion that it would be advantageous if the men had a voice in the matter?—No, I do not think so. There would be such a variety of opinions if the matter were put to the majority. The doctors would be running about to the men, and asking them to vote for them and so on.

(L.)—DOCTORS.

(L.) Doctors.

8792. They do that with regard to the adventurers; they canvass them, do they not?—Yes; but they are not likely to influence the adventurers so much as some of the men

8793. Do not the medical men take shares in a mine in order to get elected doctor?—Yes, very often.

Capt. Thomas Richards.

8935. (*Chairman.*) What is the charge made for the doctors?—Sixpence a mouth per man

8936. Is that paid for the doctor attending only to himself, and not to his family?—It is only the man; it has nothing to do with the family.

Capt. Joseph Vivian, North Roskear.

9049. (*Chairman.*) How are the fees which are paid to the school charged against the adventurers?—The club is deducted from the men the same as any other material with which they are supplied. It does not appear before the adventurers as a charge. The charge is for breaking a certain quantity of ore, or for excavating a number of fathoms of ground, amounting to a certain sum of money. The men's materials, powder, candles, clay, nails, and the various other things are furnished, and club and doctor. They pay 6*d.* to the doctor as well as to the club. Then the doctor takes them on all occasions. Formerly it was found by the surgeon that not only wounded men called upon them, but that men called upon them for colds, sprains, and one thing and another, and 15 or 20 years ago we altered the amount from 3*d.* a month to 6*d.*, in order that the doctor should attend on all occasions.

Mr. Robert Hart Pike.

9175. (*Chairman.*) How are the doctors appointed, is it by the adventurers?—By the adventurers, by a majority, or in a company which is under the management of a committee of the adventurers, it is done by that committee.

9176. The men have nothing to do in the mines with which you are connected with the appointment of the doctor?—No; but if they expressed themselves strongly against the appointment of any doctor no doubt he would be changed.

Capt. William Teague.

9377. (*Chairman.*) Then you do keep an account?—Yes, we cannot run it out without keeping an account, but there is no separate account. If we have five men on the club, those five men are charged as an engine would be charged; we pay Tom, Dick, or Harry so much a month, whatever claim they have upon the club. There is no club account kept, but we can look at the books at any time, because our doctors' account is exactly the same as the club account; they are in equal sums. The doctors are paid their pence, and the club is so much, but it is not carried to account; it is made the adventurers' account.

9413. That they are obliged to pay a doctor whom they may not wish to employ?—In some instances they do.

9414. How many doctors have you to your mine?—Three.

9415. Cannot the men choose which doctor they shall go to?—No, the doctors generally divide their work according to the districts.

9416. The doctors divide among themselves the districts which they attend?—Yes.

9417. Do they often appoint assistants?—Most of them have assistants.

9418. (*Mr. Holland.*) Do they turn the mine work over to the assistant?—They do not profess to do that I believe; ours do not, and I believe that most of them do not, but the assistants are called in to help them. I I suppose that the doctors like to find them work when they have got them, and have the paying of them.

9419. (*Chairman.*) Is there any inquiry into the qualification of a doctor before he is appointed?—That is what I cannot enter into. I do not know what arrangement they make, I only know that I see assistants.

9420. The assistants are not always qualified persons?—I do not say that.

9421. Is there any security for their being qualified persons?—I have never seen any security given for their being qualified persons; we imagine that the doctors themselves make every inquiry to get the best assistants.

9423. (*Mr. Davey.*) Would there not be some difficulty about that in men changing frequently?—There may be difficulty, but I do not see why it should not be overcome. There are three doctors in the mine; the men might be asked "Which will you pay your money to?" "I shall pay my money to A, he has attended me for some years and he has done justice, and I shall be pleased;" and I believe that being pleased is half the cure, if a man is satisfied with the medical man.

(L.) Doctors

Mr. John Richards.

9560. (*Chairman.*) What is the charge made to the miners for the doctors?—6*d.*; then the doctor must attend them through sickness or hurts; that is, the man himself, not his family.

Mr. Joseph Jewell.

9691. (*Mr. Kendall.*) Do you think it would be a good plan if, instead of having doctors specially appointed to take the mines, you had doctors for a district, and if they agreed to attend to any man who might come to them?—I think that that would be a very good plan.

9692. Do you think there would be any difficulty in getting the medical men to fall into such an arrangement as that?—I cannot say. I think it would be a good plan, for then a man might choose his own doctor.

9693. And then the doctor would have the doctor's money, whoever he might be?—Yes.

Capt. James Pope.

9927. (*Chairman.*) What is the doctor's fee?—6*d* per man per month, that is including sickness as well as hurt in our mine.

Capt. Joseph Cock.

10,026. (*Chairman.*) What club money do they pay?—1*s.* a month; that is for doctor and club.

Mr. Phillip Vincent.

10,448. (*Mr. Kendall.*) Have you ever been underground at all?—Never, but once.

Capt. Joseph Vivian, Huel Fortune.

10,723. (*Chairman.*) What deduction is made for club money?—6*d.* for club and 6*d.* for the doctor.

Capt. William Chappell.

10,818. (*Chairman.*) And how much for doctor?—For doctor they pay 6*d.*; that is, round here.

Capt. John Hancock and Mr. Michael Morcom.

11,301. (*Chairman.*) How much is charged for club and doctor?—6*d.* a month for the club and 6*d* for the doctor.

Capt. James Phillips.

11,736. (*Chairman.*) Do they pay 9*d.* for the club and 9*d.* for the doctor?—Yes.

Capt. Zacharias Williams.

11,876. (*Chairman.*) What is the amount paid to the doctor?—9*d.*; but then he attends any man that is sick or hurt, and the family for that.

Mr. William Skewis.

11,988. (*Chairman.*) What is the charge made for club money?—9*d.* per man for doctor and 9*d.* for club.

Mr. William Goddan.

12,089. (*Chairman.*) What is the amount paid for club money?—9*d.* club and 9*d.* doctor; 1*s.* 6*d* a month.

Mr. James Hosking, Drake Walls Mine.

19,079. (*Chairman.*) How are the doctors paid?—Every man subscribes 15*d.* a month for doctor and club.

19,080. Is the club merely for visible hurt or for sickness?—For hurt, not for sickness.

19,081. How much does the doctor get out of the 15*d*?—9*d.*

19,082. And the rest is for the men in case of injury?—Yes, in case of an accident.

(L.)—DOCTORS.

Mr. William Gard, East Gunnislake, &c.

19,164. (*Chairman.*) What is the deduction for the doctor?—9*d.*, we charge 1*s.* 6*d.* We do not allow any sick pay, for this reason, that very often in a mine old men come in whose constitutions are broken before they come there; they get laid up, and there is so much taken away from the fund which would otherwise go towards the man who is hurt, and who then requires everything that you can give him, therefore we prefer accumulating a large fund for a man who is hurt; and they all of them have their own sick clubs. I take it that if we allowed sick pay, in fairness to the men, we ought to have every man medically examined before coming into the mine; a young man would have to pay to the support of an old man. If you have a given number of men there must be a given sum subscribed.

Mr. William Hosking, West Beam Mine.

19,310. (*Mr Leveson Gower.*) Is there any medical man attached to your mine?—There is.

19,311. What is his name?—Mr. Bean.

19,312. How is he remunerated?—By the men subscribing so much per man per month.

19,313. Is that for sickness as well as accident?—Yes, every man who works in the mine pays 1*s.* a month, and then the medical man attends them in sickness and accident, and also their families, their wives, and their children, for that money.

19,314. If they wish to see any other medical man, have they the option?—Yes, they have.

19,315. Do they make use of that option?—No, I do not know that they do. They are very well satisfied with the medical man that we have. He is considered a very skilful man, and attends to the men very well.

19,316. Does the fund only go to the one medical man?—The fund only goes to the one medical man.

19,317. If they went to another man, they would have to pay him?—Some of them may live five miles out, and if they wish to have a medical man close at hand, they can have him, and he is paid by the fund as well as the others.

Mr. Joseph Phillips Nicholls, Frank Mills and South Exmouth Mine.

19,503. (*Chairman.*) Do the men pay club money and doctor?—Yes, the miners; but the surface men do not pay club, but only doctor.

19,504. How much do the men pay?—9*d.* a month for doctor and 9*d.* for club. The boys and girls pay 3*d.*

19,505. Is the club money for visible hurt, or sickness?—For visible hurt. A great many of the men are in the parish clubs, and if they are sick and receiving pay from both clubs they get more than if they are working. We are continually giving; in any case which we think deserving we help them.

19,506. Is there a separate account kept of the club money?—Yes. We give them gratuities; at the last pay day we paid 6*l.* to the men that were sick; but they cannot claim it. The boys and girls have nothing to do with the club; the 3*d.* is for the doctor. The doctor attends them for everything and also the underground men.

(*a.*)—APPOINTMENT OF DOCTORS.

Capt. Richard Boyns.

6773. (*Chairman.*) Is there any examination or qualification for a doctor to be appointed as a mine doctor?—I cannot say much about that. I think that is done by interest principally. In some of the mines in the parish the men have the control so far as to make choice of their own doctors and keep their own club, but this is a bad way of getting on. We find that these things do not last long; they are generally knocked up. Our club is a great benefit.

Capt. Thomas Trahair.

6961. (*Chairman.*) How are the doctors appointed?—Our doctor is appointed by the men, not by the adventurers.

6962. How is the election of the doctor made by the men?—They call a meeting, and decide the matter by a show of hands.

(L. *a.*) *Appointment of Doctors.*

6963. Do you think that the men are more satisfied with the medical men as they are selected by themselves?—Yes; there is no question about it.

Mr. Samuel Higgs.

7925. (*Chairman.*) How are the doctors appointed?—They are generally appointed by the adventurers, but sometimes lords have a clause introduced in the leases giving them the power of appointment. In some mines I have known that it has been put to the vote among the men to choose the doctor.

Mr. George William Bevan.

8256. (*Chairman.*) How are the medical men appointed?—By the adventurers.

8257. Is there often a competition between the different medical men to obtain the appointment?—Very seldom; as in other cases the medical men have their friends, and they get appointed.

8258. Do they apply through their friends, and through the adventurers?—Yes, sometimes, and by becoming an adventurer in a mine is appointed surgeon. I have been an adventurer in the Providence mines ever since they first commenced.

8259. You were appointed surgeon?—Yes.

8260. And you were an adventurer at the same time?—Yes.

8261. Do medical men often become adventurers in mines for that purpose?—Not always; some men are fond of speculating in the mines.

8262. And they may speculate for the purpose of obtaining employment?—Yes, that is one advantage.

Capt. Charles Thomas.

8790. (*Chairman.*) How are the doctors appointed?—They are appointed by the adventurers always. The men have no voice in that.

8791. Is it your opinion that it would be advantageous if the men had a voice in that matter?—No, I do not think so. There would be such a variety of opinions if the matter were put to the majority. The doctors would be running about to the men, and asking them to vote for them and so on.

8792. They do that with regard to the adventurers; they canvass them, do they not?—Yes; but they are not likely to influence the adventurers so much as some of the men.

8793. Do not the medical men take shares in a mine in order to get elected doctor?—Yes, very often.

8794. Are they ever nominated by the lord now?—I have not heard of any instance of that kind in any mine that I am connected with.

Capt. Thomas Richards.

8938. (*Chairman.*) Are the doctors appointed by the adventurers?—Yes.

Capt. Joseph Vivian, of North Roskear.

9053. (*Chairman.*) How are the doctors appointed?—The doctors are appointed generally by the adventurers at a public meeting. There is some little objection occasionally, and some men believe that they ought to have the fixing of the doctors for themselves, and I have thought so too. If there is a doctor's fund to draw from, and if a man is wounded, let him say for himself whom he would like to have, because one man would like one doctor, and another man would like another.

9054. You think that that would be desirable?—It would be desirable if it could be carried out. We have nothing to complain of in our surgeons. Some men sometimes live miles apart. Many of our men live three miles from the mine.

9055. And it is often a long way to go to a doctor?—Yes; and then they like the doctor that they have had in their family.

9056. Would the sum charged against the men for the doctor be sufficient to pay the salary of the doctor if they selected their own doctor?—I think it would. I think that we could do it upon an equally small scale. Formerly we used to have from 1,000 to 1,100 people for many years at North Roskear, and now there are only about 500 or 600 altogether.

8057. How would it do if there were doctors and dispensaries for a certain district, combining small mines with large mines?—There are the same surgeons now to a great many of the mines, and, as far as I know of

(L. a.) *Appointment of Doctors.*

them, altogether they are very attentive men indeed, and very able men in the profession. At least I believe so.

Capt. William Teague.

9409. (*Chairman.*) How are the doctors appointed?—They are appointed principally from the adventurers, I believe, generally speaking.

9410. Do not they very often become shareholders?—They sometimes become shareholders, and then I suppose they think they have a claim.

9411. Are the men consulted at all with regard to the doctor?—Very rarely.

9412. And you think that that is a cause of dissatisfaction with them?—I think so.

9422. But the men are not satisfied with the assistants?—At times they are not What I should like to see introduced would be that if there are three or four doctors about a district they should be named to the men, and that the men when they come into the mine should make choice to whom they should pay the money.

Mr. Joseph Jewell.

9679. (*Chairman.*) Are the doctors appointed by the managers or by the adventurers?—By the manager. Mr Taylor generally takes it upon himself to appoint the doctors. I have been under him for 25 years, and it has ever been so since I have been with him We appointed the doctors, or he did, a few months ago at West Tolgus.

9680. Does that mode of appointing the doctors give satisfaction to the men?—Sometimes it does, and sometimes it does not.

George Smith, Esq., LL.D.

10,301. (*Mr. Holland.*) Are the adventurers careful to appoint doctors who will be acceptable to their men? Is that a matter of careful consideration?—I believe it is. In the 40 years that I have been very intimately connected with the mining of this neighbourhood, I have not known but one instance that has excited serious dissatisfaction.

10 302. There is no job in it?—I think not

10 303. It is done with a fair view to the men's interests and wishes?—I believe so

10,304. Is there generally more than one doctor to a mine?—Very frequently

10,305. And have the men a free choice as to which doctor they will go?—Yes.

10,306. There is no compulsion?—Not where there is more than one surgery, except the compulsion which geography gives When in a large mine there are two doctors they often reside in different districts.

10,307 Would it be desirable to have a wider choice of the doctors of a mine; for instance, to have in a district a number of mines connected together with the same doctors?—I do not think that necessary

10,308 (*Mr. Kendall.*) Supposing that, instead of having a couple of doctors employed to superintend one mine, you had a district of mines and a district of doctors, so that each man might employ whatever doctor he liked, and that doctor should take up the amount which that man pays to his mine; how do you think that that would act? He would then have the nearest doctor, or the man of his choice?—I really do not know.

10,309. If feasible, do you think that it would act well?—It might in many cases be an improvement, but as far as my observation goes I have not heard that there is any practical grievance in the present mode of appointing surgeons.

10,310. You have had very large experience, and according to your experience you find that, taking the doctors and the men, they very fairly agree with each other?—I think they generally do.

10,311. And that the men are very fairly content?—As far as I am informed.

10,312. I suppose that under any system there would be a little grievance now and then?—Most certainly.

Trevn, Camborne,
28th Jan. 1863.

My Lord,

Since giving my evidence before your Lordship and the other members of the Mines Commission, I have been led to inquire into the opinions and feelings of the miners on the manner of appointing the mine surgeons, and extent to which they are satisfied with the existing arrangements in use for that purpose.

And from careful and extensive inquiry, I find that I was much mistaken in the evidence I then gave on this subject Although the men but seldom loudly complain, and are not forward, for obvious reasons, to speak on the subject, I am convinced that there is among them an extensive and deep-seated dissatisfaction with the manner of these appointments, and not unfrequently with the professional men who are so appointed.

I have now no doubt whatever that any measure which would give every man the free choice of a surgeon in any case of accident or illness, would be hailed by them as a great boon.

I have the honour to be,
Your Lordship's very obedient servant,
(Signed) George Smith

The Right Honble.
Lord Kinnaird, K.T.
&c., &c., &c.

Capt. John Hancock and Mr. Michael Morcom.

11,314 (*Chairman.*) Are they appointed by the adventurers?—Yes.

11,315. Have the men anything to say in the appointment of the doctors?—Yes; I think they have. We should not appoint a medical man if the men were opposed to it.

11,316. How would you ascertain that?—Soon after I came to Polberro there was an objection made by the men to having doctors from Redruth. They were old respectable medical men from Redruth, but the distance being so great, and there happening to be a medical man residing in the place who had nothing to do with our mine and who was a great favorite with the working men, they petitioned to have him appointed, and our managers in London agreed to it.

11,317 Is it desirable to have a medical men near to the men in case of accident?—Yes; we have both in the village, and they are very attentive.

11,318. I suppose that a doctor residing at a distance would be obliged to employ an assistant, or would the men have to go with him?—They would have to go to him. In fact they escape a great deal of the work by living at a distance; it falls on the medical man living on the spot.

11,319. Whether he is employed by the mine or not?—Yes; it is not worth their while to go five, six, or nine miles.

11,320 Do they, living at that distance, receive the 6*d.* per man?—They do in many cases. There is a great deal of interest in being appointed medical man to a mine.

11,321. Does a medical man get shares in a mine and canvass for the appointment?—Not to my knowledge. Sometimes the lord of the soil in granting a set will stipulate to have his own medical man; that is very often the case.

Capt. Z. Williams.

11,881. (*Chairman.*) Are the doctors appointed by the adventurers?—No, they are not appointed by the adventurers, they are chosen by the men and accepted by the agents; the adventurers do not take any thought or care about those things, it is the mere wish of the men for such and such a doctor to attend them.

11,882 How do you ascertain what the wish of the men is?—We ask them

11,883 How do you ascertain whether the men are or are not unanimous in the choice of a doctor?—When any man comes into a mine as a fresh miner to work we ask him then, or in the course of a month, what doctor does he wish to pay to, and he will say so-and-so, then this man is put down to pay to Mr So-and-so, that is how we do it.

11,884. But is it compulsory upon him to pay to one of the three?—No; there is no obligation; he may have any doctor, nor are they obliged to pay to a doctor if they have not a mind to do it.

11,885. Then they need not pay the ninepence if they do not choose to do so?—No.

11,886. Do many of the men object to pay to the doctor?—There are certain farming men who come in just as labourers, but not the miners.

11,887. Is that ninepence per head so contributed by the miners applied in payment of the doctors?—Yes; fairly I should think out of 150 men there are not 10 who are not under the care of the doctor.

(L.)—DOCTORS.

11,888. Are the doctors satisfied with what they receive in that way?—We do not hear any complaint, and I believe that they are very well and fairly paid.

Mr. William Skewis.

12,002. (*Chairman.*) Can the men choose which of the four doctors they will go to?—Yes.

12,003. Could they go to any other doctor, and yet receive pay from the club?—We have a doctor's book, and the men come in and put down as to what doctor they wish to pay, and then we keep an exact account; they mention one, and then that money is charged to that doctor.

12,004. Might it be any other doctor than either of the four attached to the mine?—Whatever doctor the miner chooses.

12,005. Do you think that that is sufficient remuneration for the doctor?—They never complain of it; they are always satisfied with the 9*d*.

12,006. And the men are satisfied if they obtain the assistance of the doctor whom they prefer?—Yes, quite so.

Mr. William Goddan.

12,110. (*Chairman.*) How many doctors have you to the mine?—The men are allowed to choose their own doctor; we take down the names and they pay 9*d*. a month.

12,111. Are the doctors satisfied with that mode of payment?—Yes.

12,112. (*Mr. Holland.*) Can the men choose any doctor whatever?—Any doctor whatever, whom the men like to choose.

12,113. They are not appointed by the mine at all?—They are not.

12,114. (*Chairman.*) When the men join they name what doctor they wish to attend them?—We do that every two months, or every, month if they like; the men would sooner have it in that way.

12,115. (*Mr. Holland.*) Do the men choose as well as you could choose for them?—Better.

12,116. Do they choose the best doctors in the place?—I think they do.

Mr. Joseph Matthews.

18,894. (*Chairman.*) Is there a doctor appointed to the mine?—No; we appoint no doctor, but we leave the choice of the doctor to the men themselves, so that any man may choose what doctor he pleases, and each doctor is paid in proportion to the number of men that he attends.

Mr. Richard Sleman.

18,934. (*Chairman.*) You receive from the club money according to the number of men who choose to apply to you for medical assistance?—Yes; that is the custom of our neighbourhood.

18,935. The men select the surgeon, and the surgeon is paid for the number who come to him?—Not for the number who come to him, but the number on the list for the surgeon.

18,936. Is that for the year or for any limited period that the men select?—That depends upon different mines. In Wheal Maria the selection is once in three months, but in Wheal Friendship and some other mines the men have the power of selecting when they please; for instance, if I give dissatisfaction to a man he has only to go to the purser and have my name struck off the list and another substituted.

18,954. (*Mr. Holland.*) Have you ever been at a mine where the doctor was appointed by the adventurers?—Yes.

18,955. Which is the best system?—The system where the men choose the doctor is by far the best; it is best for the adventurers, it is best for the doctor, and it is best for the men.

18,956. Is there less grumbling?—There is no grumbling at all.

18,957. The men just change their doctor as they please?—Yes.

18,958. Is there any canvassing?—No; it is quite unnecessary, it is of no good; if you have not anything like a standing, it is of no use to ask a man to employ you.

18,959. We were told in Cornwall that there was danger in this system, from the doctors and the men acting rather unfairly towards each other, the doctors canvassing for names?—That is all very well in theory. I was with Dr. Harness, under the old system; he happened to be a nephew of Mr. John Taylor, who has just died, and it broke down under him; he had other practice which was more remunerative, and he did not care so much about the miners, and then Mr. Taylor determined to throw it open. Wheal Friendship was the first mine in this neighbourhood where it was thrown open; since that, you never hear anything like a row.

(L. *a.*) *Appointment of Doctors.*

18,960. Does this system, in your opinion, give any unfair opening to a low class of practitioners?—No, it cannot; a man must be qualified. I think that as the men pay the money the other is a most unfair plan.

18,961. You think that that objection is merely fanciful?—Yes. There are one or two mines in this neighbourhood which are not upon this system.

18,962. Do they go on as satisfactorily?—Not at all.

19,024. (*Mr. Kendall.*) How many medical men are there at Wheal Friendship?—There are only two. I am not certain whether there may not be another medical men, but two, I should say.

19,025. How many medical men are there at the Devon Great Consols?—I can hardly say now. I think that I attend about 250. I do not trouble myself to ascertain who are attending the men. I am satisfied with the number that I have.

19,026. Have you ever conversed with any of those surgeons who have very few miners?—No.

19,027. Therefore you do not know what their opinion is as to the present system; you think it a good one, and the fairest to all parties?—There is no question about it; it does not admit of an argument.

19,028. Have you ever discussed the matter with the medical men who have very few miners?—No; in some mines I have very few.

19,029. You never heard any complaint of other medical men?—You cannot have a complaint where the list is fairly kept; there is no right to complaints.

Mr. James Hosking, Drake Walls Mine.

19,084. (*Chairman.*) Then the men choose either of those two doctors?—Yes.

19,085. But these two are appointed by the adventurers?—Yes.

Mr. William Gard, East Gunnislake, &c.

19,162. (*Chairman.*) How are the doctors appointed?—I appoint the doctor.

19,163. The men have not a choice in the doctor?—No; I have never in any mine, where I have had the management, allowed them to choose the doctor.

19,166. The men have never objected to the doctor?—No.

Mr. Joseph Phillips Nicholls, Frank Mills and South Exmouth Mines.

19,507. (*Chairman.*) By whom is the doctor appointed?—By the purser, and the men have a voice in it. When the present doctor was appointed it was left to the men whether they would like him or not. There has never been a complaint against him.

19,508. If the men were to go to another doctor, could the money be applied to him?—No. If they entered any just complaint against the doctor, he would be changed.

(*b.*)—POST MORTEM EXAMINATIONS.

(L. *b.*) *Post-mortem Examinations.*

Mr. Andrew Kingston.

3433. (*Chairman.*) Do you ever have an opportunity of making post mortem examinations?—Never; I think I can hardly recollect a case, except through the coroner. I have tried very hard on one or two occasions, but I have failed.

3434. (*Mr. Kendall.*) Have their friends objected to it?—Yes; they have. There are some cases that would be very interesting, and that one would like to examine.

Mr. Richard Quiller Couch.

6420. (*Chairman.*) Have you had any opportunities of making post mortem examinations in such cases?—Yes; perhaps in 20 or 50; but it is very difficult to get them.

(L.)—DOCTORS.

(L b.) Post mortem Examinations.

Mr. James Richard Quick.

6608. (*Chairman.*) Have you made any investigations into the diseases by means of post mortem examinations?—I have never had an opportunity of making one, there is always such an objection to it amongst the miners or their friends.

Mr. George William Bevan.

8221. (*Chairman.*) Have you ever made any post mortem examinations?—No; I have endeavoured to do so several times, but I have not been allowed.

Mr. Philip Vincent.

10,389. (*Chairman.*) Have you ever had a post mortem examination of a miner?—Yes.

10,392. Will you describe to the Commissioners what you observed on the occasion of the post mortem examination for the miners' disease?—On making the post mortem examination I found that the lungs were extensively diseased, indeed, there were deposits in the lung of a substance which on taking it between my fingers presented the appearance of very fine powder made into small lumps, and in this powder there was a gritty substance which had the appearance of fine gravel; it looked very much like it. I did not analyse it, because I was satisfied in my own mind what it was, and I found several of the deposits in the lung.

10,393. (*Mr. Holland.*) In the air cells?—Yes. It appeared to me in one or two places where these deposits took place that there was pus forming around this, and there was a slight inflammatory action around, which had all the appearance as if this foreign deposit had been the means of producing some inflammatory action, and then of sending the miner into consumption. That was one case in particular, which was a very interesting one. An assistant of mine took notes of it, but he left me, and unfortunately took away the notes. He went to Australia, and what has become of them I do not know.

(L b.) Post mortem Examinations.

Mr. Thomas Hutchinson.

10,545. (*Chairman.*) Have you ever had an opportunity of making post mortem examinations?—Not in any case of miners' affections; not in disease of lungs.

James Jago, Esq., M.D.

10,612. (*Mr. Holland.*) Have you had an opportunity of making post mortem examinations in the cases of miners' consumption?—Never. I asked Mr. Hutchinson, about a year ago, for an opportunity. I said that I would come to this town at any time on purpose, and he promised to bear it in mind.

10,613. Is it not most desirable for post mortem examinations to be made, to ascertain the exact nature of the disease?—Yes; and I think it is quite easy to obtain them by anybody living in the neighbourhood of the mines. I do not believe in the prejudices of the people, for I find that a medical man can persuade the relatives, if he likes, to allow post mortem examinations to be made.

10,614. Are they not made because surgeons have not time for them, or that they do not think them worth inquiring into?—Mine surgeons have little spare time, whilst many of them are prepossessed with the notion that miners have a repugnance to post mortems.

Mr. John Permewan.

10,655. (*Chairman.*) In your experience have you made any post mortem examinations?—I have never had an opportunity of doing so. I cannot do it.

(M.)—DWELLINGS.

(M.) Dwellings

(M.) Dwellings.

Mr. William Wale Tayler.

3840. (*Mr. St. Aubyn.*) And, therefore, as a consequence, he would be more likely to be affected by any bad influences with which he might meet underground by the bad state of the dwellings above?—I wish to correct an impression which I see you have with regard to the dwellings of the miners; I only allude to very few which are in this bad state. I suppose that you would find no cottages neater or cleaner than a miner's cottage, as a general rule, but I speak of some which are badly drained.

George Smith, Esq., LL.D.

10,332. (*Mr. St. Aubyn.*) Do you mean leasehold houses?—Yes; I think that there are 800 houses in this town the property of labouring men, and almost entirely of labouring miners, which they have built themselves, and which they have for three lives. I am told that the aggregate amount of house property belonging to labouring miners in Camborne exceeds 50,000*l*.

10,333. You consider that an evidence of their prudent habits?—Of their prudent habits, and of their temperate, orderly, and good conduct.

10,334. Do you think that miners are more in the habit of living in their own houses now than they were 30 years ago?—Yes, beyond all comparison.

10,355. And that is an evidence of their improved habits, and their increasing prudence and foresight?—Yes.

10,336. (*Chairman.*) What is the cost of building one of those houses?—From 50*l*. to 80*l*.

10,337. Do they borrow a part of the money to build?—Sometimes, but seldom.

10,338. (*Mr. St. Aubyn.*) What would each miner pay on his house as the ground rent?—4*s*. or 5*s*.; 1*s*. a lace.

10,339. (*Mr. Kendall.*) Have all those houses gardens?—Almost all of them.

10,340. What is the extent of the gardens; how many yards?—From five to ten laces. A lace is 18 feet square.

10,341. (*Mr. St. Aubyn.*) Do you find that the men not only take a lease of houses on lives where the house is already built, but that they build houses themselves on waste land?—Almost all these houses have been built by the miners.

10,342. Where do they get the money? by mortgage partly?—Not extensively. The way is this: the fluctuations in miners' wages are such as to give any prudent, good miner, once or twice in his lifetime, at least an opportunity of getting 40*l*. or 50*l*. as a start in a month or two.

10,343. (*Chairman.*) You allude to tributors?—I allude to tributors. The only difference is, where a man has a wife who will manage without going deeply in debt. If they are deeply in debt, every one of these starts is swallowed up. If they have managed to live without getting into debt when they get this start, the first thing they do is to build a house.

10,344. (*Mr. Kendall.*) Almost every active and clever miner, if he is prudent, becomes a tributor?—Most certainly.

10,345. And every tributor, if he is a prudent man, and has a fair chance, has in his lifetime one or two chances of making a start, coming into a batch of ore, and making large wages?—Yes.

10,346. And he builds a cottage entirely with his own money, or with money which he borrows?—Just so.

Mr. Philip Vincent.

10,452. (*Mr. Kendall.*) Taking the miners' houses and the agriculturists' houses, speaking of labourers, which do you think are the most comfortable?—The miners, decidedly.

10,453. Cleaner?—Much cleaner.

10,454. And much more comfortable?—Yes.

10,479. Do you know how much a house costs?—The price is generally from 50*l*. to 60*l*.

Mr. Joseph Matthews.

18,912. With regard to their accommodation in their own houses, do as many sleep in a house as used to do, or not?—I think that, as regards those who live in town, there is a very great improvement in that respect; but in the country, I think, most of the families have two bed rooms, and a room down stairs for cooking, and so on.

18,913. (*Chairman.*) Can you speak as to the lodging of miners, whether, when a man is married; several men lodge with him, and whether two men sleep in a room?—I don't think that this prevails amongst miners

(M.)—DWELLINGS.

working at Wheal Friendship, whether they live in town or in the country.

18,914. You cannot speak as to overcrowding?—I do not think that there is anything of that kind.

Mr. William Gard, East Gunnislake, &c.

19,213. (*Sir Philip Egerton.*) Do they take lodgers?—Yes, unfortunately there is too much of that.

19,214. They are too much crowded?—They are very much overcrowded, and the sanitary condition of the village is very bad. I believe that there is nothing which tends so much to the deterioration of the miner's health as the state in which all these little dirty villages are

19,229. (*Chairman.*) You have stated that the condition of some of these mining villages is very injurious to health?—Deplorably so.

19,230. Has the Sanitary Act ever been put in force?—Yes. I was chairman of the committee for two years, and took a great deal of interest in trying to have it carried out, but was beaten by the owners of cottages; they found that I was making them drain. In the committee which was working there, of which I was chairman, I had farmers for my team; they were very difficult to drive at first, but at last I got them to work the Act, and when the owners found that they were compelled to drain and remove pigsties, and put up water closets, those who owned these miners' cottages immediately set to work and we were all turned out together. There were two medical men, Dr. Sellors was one and Mr. Wood the other. We were all sacked at once, and a set of men were put in purposely not to carry the Act out. The law has lately been altered, so that if the Act is not carried out by a committee it is put in the hands of the guardians, which is only going from bad to worse, and making it very certain that it shall not be carried out, because the guardians, beyond the parish, have no interest at all in your parish, and those who are within your parish, if they wished to carry it out, would carry it out under the Nuisances Removal Act by a committee; but they have done nothing of the sort; they have obstinately prevented it. I wrote to the Board of Health, and they sent a medical officer down there. He went about and said that it was very horrible, and that he had never seen anything worse in all the inspections which he had made. I said, "Is there no remedy?" He said, "It would not do to let all the world know it, but we cannot enforce it if the Nuisance Removal Committee do not choose to act, and if the householders choose to combine."

(M.) *Dwellings.*

19,231. (*Mr. Holland.*) Why do you not indict yourselves?—I do not know who is to go to the expense. We have 8,000 inhabitants in our parish; the bulk of them are labouring men. Those who own cottages have a direct interest in giving the least amount of accommodation.

19,232. Can you suggest any remedy?—My remedy is that the General Board of Health should be empowered to carry out the Nuisance Removal Act.

(N.)—CHILDREN WORKING IN MINES.

(N.) *Children working in Mines.*

Mr. Francis Puckie.

4890. (*Chairman.*) Do you know the age of the youngest who is working underground?—No; I do not know; but I should say about 12 years of age.

4891. Do they go down to work with their relations?—Yes; perhaps father and son.

4892. Do you think there are none working underground below the age of 12?—I cannot say that there is not; but I should calculate 12 years to be about the youngest

4893. Are there none, to your knowledge, under the age of 12 working underground?—No.

Charles Barham, Esq., M.D.

5304. (*Mr. Holland.*) You said that you thought mining much more injurious to growing than to mature age; do you think that that is a fact which has been proved statistically?—I think so; statistically you may find, I think, that the mortality is great at an early age.

5305. That is, that miners who begin at an early age are less healthy than those who begin at a more mature age after growth?—Yes, that is the result of my own inquiry.

Capt. Charles Thomas.

8647. (*Chairman.*) Does the return which you have sent in give the ages of the boys who are employed underground?—Yes.

8648. On the dressing floors, what is the age of the youngest children who are employed there?—There are a few at 9 years of age, but very few indeed; at the age of 10 and 11 there are a great number; there may be one or so between the age of 8 and 9, but it is a rare occurrence for any one of them to be younger than that.

8649. Is there any limit to the age at which you receive them at the dressing floors?—No; a father or mother will come and say perhaps, "I have this little "child, and I do not know what to do with it; I can "scarcely get bread for it, will you take it?" and we sometimes yield to that, and take the child in to do such work as it can do, but it is very light work.

8650. What are the lowest wages that they receive?—6*s.* a month is the lowest wage.

8651. Are there any evening schools established to which these children can go of an evening to receive instruction?—There are schools to which they can go in the evening; some schools, but not enough to take one tenth of them, I should think.

8652. So that many of these children have not an opportunity of obtaining any education if they go so early to work?—Not in the evening, except in the Sunday schools, and they are open to all that will come; we have sufficient room there for all the children, and a large proportion does attend the Sunday schools connected with the Church of England, the Wesleyans, and other sections of the church; a very large proportion of them do attend.

Capt. Joseph Vivian.

9037. (*Chairman.*) Have you charge of any other mines?—I superintend North Crofty, a mine adjoining, and South Condurrow.

9038. I think that you have sent in a statement of the number of men employed?—Yes, a statement of the men and of their ages.

9039. What is the youngest age at which children work on the surface?—I should think some of them may be as low as about seven years old; they are employed at little light work.

9040. I suppose they are sent to that as their parents cannot afford to send them to school, and they are obliged to be sent to work?—Yes; as many as can well afford to do it send their children to school. We have a school here, and we support them from the mine.

9041. The young children of the families of miners employed with you are sent to the school?—They go to the British School.

George Smith, Esq., LL.D.

10,277. (*Chairman.*) How is it as to the day schools?—Of day schools there are very few. I do not know how many children attend the National School. I suppose that the British School would have at least 300, or from 300 to 350. I have a very strong impression that the provisions of the Factory Act ought to be applied to all our large mines.

10,278. (*Mr. Holland.*) What provisions?—Provisions for obliging the proprietors to educate all children under a certain age for so many hours a day.

Capt. Zacharias Williams.

11,800. (*Chairman.*) Do you limit the age at which boys are permitted to go to work underground?—We generally calculate to take them in at from 13 to 14 years of age. If there should be at a particular time a certain one who is younger, the father always takes charge of him. We give him over to the charge of his father and he must take all the consequences of anything that may happen.

Q

(N.)—CHILDREN WORKING IN MINES.

(N.) *Children working in Mines.*

11,801. You allow a father to take his son down into the mine at any age he pleases?—Yes, from 12 to 13.

11,802. But would you prevent a father taking his son down if the boy was younger than that?—We should object to it.

Mr. Thomas Morris, Devon Great Consols Mines.

18,714. (*Chairman.*) Is there any age to which the boys are limited in going underground?—Very much depends upon their size, because some boys are as big at 10 as others would be at 12; we do not let very little boys go underground.

Mr. William Hosking.

19,370. (*Sir P. Egerton.*) And the miners take advantage of it?—Yes.

19,371. At what age do the children begin upon your works?—It varies.

19,372. At about what age?—I should say about nine or ten.

19,373. How many hours do these children of nine or ten work?—They go to work at seven in the morning and leave work at five, and they stop for one hour in the middle of the day for dinner.

19,374. After they come upon your works those children have not much time for education, I presume?—No.

19,375. Do they attend evening schools?—Some of them do; they work in our mine the same as in all mines in the two counties.

19,376. Do you find that the children in your mines can read and write?—They all of them can read, but they cannot all write.

(O.)—WOMEN WORKING AT SURFACE.

(O.) *Women working at Surface.*

Mr. Thomas Trevelyan.

1158. (*Chairman.*) You have none for breaking?—No; we keep men for that.

1282. Do they work under cover?—Most of them work under cover.

Mr. James Seccombe.

1531. (*Chairman.*) Do the women on the surface work under cover?—I believe that ours are very nearly all under cover. We have, perhaps, half a dozen pairs at East Caradon, that are not quite provided yet; but as to all our women employed in cobbing, bucking, and rolling, we have sheds to contain the whole.

1532. Is any room provided for them to get their dinner or tea in?—We have no room for that, on purpose.

Mr. Peter Clymo.

2210. (*Chairman.*) What is the nature of the work in which the women are employed?—The women are employed in separating the ores.

2211. And at the South Caradon mine they work under cover?—Yes, principally.

2212. You think that that is an advantage and comfort?—Yes, it is a great comfort both in winter time and in wet weather.

Mr. William Johns.

2499. (*Chairman.*) Do the women work under cover at your mine?—Yes, in some cases.

2500. I suppose they are the better for working under cover?—Yes; but they cannot always work under cover; we work them all under cover as much as we possibly can.

2501. Have they any room set apart for themselves to enable them to boil their water for tea?—We have three for the girls working on the floors at the different places, and they can warm their water for their tea or for their dinner.

2502. That, I suppose, is a great comfort to them?—Yes, especially so in the winter time.

Mr. Francis Puckie.

4973. (*Chairman.*) Are the women who work above ground all under cover?—Not all, but a great part of them.

4974. Are there some places where they are working without any cover or shelter?—Yes, they could not have it.

4975. But are there places which might be covered in, and which are not covered in?—Yes. In most of our places we have sheds for them, when we can conveniently put them up; and sometimes they are working here at one minute and away at another place at another minute.

4976. Where they sit down are they under cover?—Yes, chiefly, but not all of them.

4977. Is it not desirable that they should work under cover?—It is very necessary in winter time.

4978. And in bad weather?—Yes.

Mr. William Hosking.

19,280. (*Chairman.*) Are the women employed at the surface?—Yes, what we term framing the tin.

19,821. Do they work under cover?—Yes, all under cover.

(*a.*)—HOUSES FOR WOMEN TO GET THEIR MEALS IN.

Mr. James Seccombe.

1531. (*Chairman.*) Do the women on the surface work under cover?—I believe that ours are very nearly all under cover. We have, perhaps, half a dozen pairs at East Caradon, that are not quite provided yet; but as to all our women employed in cobbing, bucking, and rolling, we have sheds to contain the whole.

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Mr. John Nancarrow.

8523. (*Chairman.*) Do the women work under cover?—Yes.

8524. Have they a place to which they can go to take their meals?—Yes; there are places in connexion with each of the dressing floors.

Capt. Charles Thomas.

8820. (*Chairman.*) What provision do you make for the women who are working on the surface, to enable them to get their dinners?—We have at the Dolcoath mine four establishments with a large oven in each of them, large enough to contain 200 pasties or hoggins. Then we have benches around a long room where they can sit down, and hot water is always prepared by the dinner time. As soon as the bell rings they rush in to get their dinners; and so many of them as like to do so join together, half a dozen perhaps purchase a tin kettle, and every one brings a cup, or as many as like to do so, and if they join together they get a little tea with the water.

EPITOME OF EVIDENCE.

NORTH OF ENGLAND.—LEAD MINES.

(A$^{\text{n}}$.)—HEALTH AND DISEASES OF MINERS.

(A$^{\text{n}}$.) *Health and Diseases of Miners.*

Mr. John Barratt, the Coniston Mines.

13,450. (*Mr. Davey.*) What is the state of the health of your miners generally?—Their health, generally speaking, is very good.

13,451 Is there any difference between the health of the miner and that of the agricultural labourer?—Very little difference, I think. The fact is that a great many of our miners have been agricultural labourers who have come into the mines.

13,452. Do they continue in good health after they come to work in the mines?—Yes, I think so. We have men working there from 60 to 80 years of age; but I attribute that in a great measure to putting all the men, as they advance in years, to work in shallow levels. But indeed, they come as a matter of course and say that they must have such and such a place. They say "It is my time now, I cannot work down any longer."

13,486 (*Mr. Holland.*) Are you acquainted with the Cornish miners?—Yes.

13,487. Are your miners very decidedly healthier than the Cornish miners are?—Yes; and they are stronger men

13,488 Have you ever observed the complaint which is called miners' consumption in Cornwall?—Yes.

13,489. Have you anything of that kind here?—No. Very rarely In fact it is not known.

13,490. It is not remarkable amongst the miners in this neighbourhood?—No.

Mr. William Mitchell, Coniston Mines.

13,576. (*Mr. Austin Bruce.*) Do you think that it is any advantage to the workmen to come to work underground at a later period of life?—Yes, I think that they generally live longer lives.

13,582. Are coughs common among the miners?—We certainly do not consider that a man enjoys such good health as a miner, that is not at the same age, as an agricultural labourer does, or a working man at the surface.

13,583. You mean in this district?—Yes; we do not consider mining to be so healthy

Mr. Benjamin Plummer, Goldscope Mine, &c.

13,683 (*Chairman.*) Have you some men who suffer in their breathing?—Yes, we have a few old men who do.

13,684. Have they been so affected since they have been with you, or were they so before they came to you?—Before they came they were ill, they suffered from chest disease before they came there; they came from Alston Moor. Nearly all the miners that I have seen, who have come from Alston Moor, above 40 years of age, have been affected in their breathing, in fact we have had men who have died, and one of them was not more than 45.

13,685. (*Mr. Holland.*) Of what disease did those men die?—The cause of their death was asthmatical complaint, or short breathing, miners' asthma or decline.

13,686. (*Chairman.*) How do the men working with you who are so affected go down into the mines?—I have always so far provided shallow places for the old men to work in, and those men who are most affected now are working at one of those little mines called Castle Nook, which is only 10 fathoms below the adit level; they go up and down by ladders to that place.

Mr. James Postlethwaite, Keswick Mines.

13,809. (*Chairman.*) Have you any men suffering from shortness of breath?—We have.

13,810. What aged men are they?—We have one aged 45 who is quite unable to work; but he did not receive his injury in our mine

13,811. Where did he work before?—In Coniston copper mines; he worked for four years at our place, and gradually became worse, and for the last four years he has not worked at all, he is lying upon the club.

13,812. Have you any men working who are suffering from shortness of breath?—Very little; our men are very sound and good. I suffer as much myself as any of them.

13,813. Do you suffer?—Yes, I am a little affected.

13,814. Do you think that that is from working?—Yes, not in this mine, but in some mines in the neighbourhood, one in Loweswater; that is not working now.

13,815. Was it bad air?—Very bad; I only worked three months in it, and if I had stayed a little longer I should have been done.

13,816. How did it affect you?—I had a sensation, a pain in the head, the pain goes right through your head, and before the end of the shift you can scarcely bear your head.

13,844. (*Mr. Davey.*) Do the men who work with you come pretty much from this neighbourhood or from other mines?—Most of them are natives of Cumberland.

13,845. And you consider that those who come from other places do not enjoy such good health as your own men?—I am not certain as to that. I have seen those men coming from Alston a little affected at an earlier age than the men are here. I have one or two Welchmen, and they are healthy.

13,846. When you find one of these miners affected by that disease, if you remove him to a healthier place or give him rest, does he improve?—They may remain stationary, they never recover.

13,847. Not if they give up that kind of life and lead another?—No; I have not worked underground myself for the last 12 years, and I get a little worse; a man will not recover, but the progress of the disease will be arrested or partially so.

13,848. But the men working in this neighbourhood are generally in pretty good health?—Yes.

13,853. (*Mr. Austin Bruce.*) Have you at this moment any men suffering from the miners' asthma; difficulty of breathing?—Two, very slightly.

13,854. (*Mr. Holland.*) You have said that there are several a little affected?—I am a little affected, but my men are very little affected; they are quite able to do the work, and they do not complain of it.

Mr. William Phillips, Greenside Mine.

13,941. (*Chairman.*) Have you some men who are affected in their breathing?—There may by chance be one, but not generally.

13,942. Have you none now working in your mine who are at all affected in their breathing?—No man who is disabled is employed to go inside or who is affected in the lungs.

13,988. (*Mr. Kendall.*) Are the men in this neighbourhood very healthy?—Yes; they are above the average.

13,989. Do you perceive any difference between the miners in this neighbourhood, particularly those employed in the blast furnaces, and other miners?—No; I see very little difference in their health.

13,990. You think that the one class is as healthy as the other?—I do not see any difference in them.

14,012. (*Mr. St. Aubyn.*) Do you think that the amount of disease is as great here as amongst the Cornish miners? —No, it is not so much by 10 per cent., and more.

14,013. Is there no climbing in your mines?—Nothing of any consequence, perhaps a few fathoms just over the stope in the footways; no such climbing as they have in Cornwall.

Dr. James Rumney.

14,049. (*Chairman.*) Is there any particular disease to which the miners of this district are subject?—Asthma generally accrues,

(A^{n}.)—HEALTH AND DISEASES OF MINERS.

14,050. Do you think that that complaint is more prevalent among miners than among other classes?—Yes: but the Greenside mines are very nearly as healthy as any agricultural district.

14,051. Are the men working in the Greenside mine subject to asthma?—Yes.

14,052. What do you consider that arises from?—From the carbonic acid and the want of oxygen or pure air.

14,053. That is what produces the effect?—Yes.

14,054. Do you think that they have become troubled with asthma from working in the Greenside mine or in other mines?—I think that the Greenside mine causes it as well, but at Alston it is far worse, those who come here are generally diseased.

14,064. Are there any cases that could be seen now?—Yes; I know four or five cases of men who do not think of seeking for advice.

14,065. But you think that they are affected?—Yes; the lower lobes of the lungs are generally very much affected.

14,069. (*Mr. Holland.*) Is there any excess of rheumatism among them?—No; except among the lads who are employed at the washing; not among the miners.

14,070. Have you met with cases of asthma accompanied with great expectoration?—Not so many; they are very rare up here.

14,071. Is it rare for the miners to have asthma at all?—No.

14,072. Do you mean that simple asthma is common; but asthma with great expectoration is uncommon?—Yes.

14,073. At what age have you noticed asthma to commence?—It commences at any age.

14,074. When they are very young?—About the age of 45.

14,075. Does it seldom come on before?—Seldom before 40 or 45; that is about the average.

Mr. Jacob Johnson.

14,141. (*Mr. Holland.*) Are the miners particularly liable to rheumatism?—Yes, they are.

14,142. Have you heard them complain very much of that?—I have heard them complain very much of rheumatic pains.

14,143. So much as to lay them up?—Yes; it will lay them up.

14,144. Are many of the miners permanently disabled by rheumatism?—I have never seen any so bad as that, but you know sometimes it will lay them up for some time, until it goes off again.

14,145. They are not permanently disabled by it, but only temporarily?—Yes.

Mr. Tinniswood Millican.

14,234. (*Chairman.*) Are the men who are working in these mines healthy?—We do not consider mining a healthy thing at the best.

14,235. How are the miners affected?—In their breathing.

14,236. What in your opinion is that occasioned by?—I should think it would be from the smoke and dust, the dust gets into their lungs.

14,237. Is there a great deal of dust in these mines?—Yes, in some of the dry mines.

14,238. Is it small dust?—Yes; we consider the wet mines the more healthy, generally.

14,239. But several of these mines are dry, are they not?—Yes, several.

14,240. How long is the powder smoke, after blasting, in clearing away?—It just depends on what kind of air it is, and what kind of current there is.

14,241. Are there any men whom you could point out who are at all affected in their breathing?—We have some at Nenthead and Garrigill.

14,300. (*Mr. Davey.*) What is the general health of your workmen?—It is about like other parts, I believe.

14,301. Do they suffer more or less than the agricultural labourers?—They are not so healthy as the agricultural labourers.

14,335. (*Mr. Holland.*) About what age does the miners' complaint come on?—That depends a good deal upon the individual.

14,336. But, generally speaking, about what age should you say, 40?—Yes, I should think so.

14,337. Do many men reach the age of 45 without it?—I should think that they would be affected mostly.

14,338. You mean, I suppose, that very few of them of that age would be without it?—Not many. I think that the greater part of them would be affected before they reached 45.

14,339. That is pretty generally so, is it?—Yes.

14,340. Do not a very large proportion of those who get above 45 die of it?—Yes, if they get above 45.

14,341. Do they die of it chiefly?—Yes.

14,342. Is it much the same complaint in them all, shortness of breath and spitting?—Yes, I should think so.

14,343. Do they appear to suffer much pain from it?—Sometimes they seem to suffer very little, just from shortness of breath, with no pain.

14,344. Do they become weak?—Yes, generally.

14,345. And gradually waste away?—Yes, but if they are kept quiet they have no pain.

Mr. Thomas Watson, Alston Moor Mines.

14,420. (*Mr. St. Aubyn.*) What, in your opinion, are the principal causes of the unhealthiness of the miners?—I think that part of it arises from the dust that comes from the rocks, similar to what a stone mason is exposed to from the stone he is building with, or when hewing such rock; very likely another part of it comes from the smoke that arises from the gunpowder, and in addition to that another cause will be the impure atmosphere, because it cannot be considered that a mine can be ventilated like the surface; no mine is in that way, and then there is this carbonic acid gas that flows out of the rock as well, and all these added together make a considerable total.

14,421. Then the want of ventilation, speaking generally, is the principal cause of their unhealthiness?—Just so.

14,422. Do you believe that the best means are now adopted for the purpose of ventilating your mines?—They are with us; we do everything that we possibly can.

14,423. Do you mean by that that you do everything that you possibly can, consistently with carrying on the mines, with reference to the expense?—No; I mean with proper regard to the men's health; suppose, for example, that a mine is a losing bargain we would just do the same thing; it is not a question of profit and loss when the men's health is concerned, we set the loss aside altogether.

14,424. Do you mean that you would work a mine at a loss in order to adopt such means as would preserve the men's health?—No, not for any great length of time; but suppose we are making a trial, and we see that there are little hopes of success, and in order to keep down the expenditure, we were to punish the men, and not ventilate properly, we should consider that decidedly wrong. If a place could not be worked properly, with a due regard to the men's health, we should at once abandon it on humane principles.

14,425. Can the present system of ventilation, as employed in these mines, be improved?—We do not think it can.

14,507. (*Mr. Holland.*) Do the great majority of the miners who reach the age of 40 suffer from lung complaints?—Yes, the greatest majority.

14,508. Is it at the age of 40 when they begin to be affected?—They begin to feel the effects of mining generally at about that age.

14,509. Have the Commissioners been correctly informed when they have been told that a miner of 50 looks as old as an agricultural labourer of 60?—I cannot say; this is not an agricultural district, it is generally all in mines, and for one agricultural labourer I know 100 miners.

Mr. Thomas Wilson Crawhall, Rodderup Fell Mine.

14,584. (*Chairman.*) Are there men who suffer from shortness of breathing?—Yes; the men have complained of it; they suffer very much in course of time from that.

14,585. At what age does it show itself generally?—I think that a great many get to be old men at 40 or 50.

14,586. To what do you attribute that?—I think that in course of time it is the quantity of small dirt and mineral which they inhale into the lungs, small particles of spar, and no doubt the powder smoke, and perhaps a little deficiency of air occasionally help it materially; but I believe that it is more the fine particles of spar which they get into their lungs than anything else.

14,602. (*Mr. Kendall.*) You do not think that any of their ill health arises from intemperance?—Occasionally there are some who are intemperate, but generally, until they get broken winded, as they call it, I think they are rather a healthy set of men.

14,603. Do you think that the quantity of dust which they inhale creates thirst?—I do not think that they are great drinkers. I have noticed a great difference between the miners and the pitmen in that respect. While the pitmen are enormous eaters, and drink a great quantity, the lead miners are generally small eaters, and do not, I think, drink nearly so much as the pitmen.

14,610. What are the first symptoms of the miners being what you call broken winded?—There is a difficulty in breathing.

14,611. What do they complain of, any weakness?—No, it is more a difficulty in breathing, and perhaps they first find it when they are climbing.

14,612. Is it a sort of asthma?—It is a sort of asthma.

14,613. If they change localities do they recover?—I do not think that if they once get bad they will ever entirely throw it off, they may be fit for several employments, but they will never be entirely well.

14,614. If you removed them to the surface, do you think that that would check its progress?—We often do so; if a man comes and makes a well founded complaint of feeling rather broken-winded, if we have any vacancy at the surface, we give him perhaps, a quarter, or half a year, or a year, as the case may be, at surface work.

14,615. And do you send him down again?—If he is fit for it.

14,616. (*Mr. Holland.*) Do they become fit for it afterwards?—If they are not very bad. I have no doubt that if men are at the proper time of life they will last another dozen years in the mines by that means.

14,617. (*Mr. Kendall.*) Still they are more susceptible than other miners?—Means should be taken to stave it off almost before they begin to feel it themselves.

14,618. (*Mr. Holland.*) I suppose it comes on very gradually?—Yes.

14,619. (*Mr. Kendall.*) Do the medical men ever report to you when a man is becoming so, and advise a change?—No.

14,620. (*Mr. Holland.*) What is your explanation of the miners eating less than the colliers?—I do not know, unless it is something in the nature of the coal pits which makes them such enormous eaters.

14,621. I suppose the colliers work harder?—While they are at it the colliers work much harder.

14,622. But I suppose the miners work as hard as they can?—Yes; it is of a different nature. In the pits it is principally pick-work.

14,623. Is pick-work harder than beating borers?—It requires quicker work in the time. I do not think it is harder work, but it is quicker work, and it will make the pitmen perspire very much more than the miners.

14,624. They drink more?—Partly they do drink more, and the pits are very much hotter than the mines. Many of our mines are cool, and on an average in fact they are cool.

14,625. Do you think that the air in the mine is so close as to injure the appetite?—No, I do not think so; even those men who are very little in the mines are also small eaters in proportion to pitmen.

14,631. Do nearly all the miners become broken winded when they get to 40?—It is perhaps hard to say that, but a good many do.

14,632. A very large proportion?—A considerable proportion, say at 50, at any rate. I would not say 40, but by 50 they do.

14,633. You consider a miner when he gets to be from 50 to 55 an old man?—Yes, if he has been all his life in the mines.

14,634. Is that a general observation?—Yes.

14,656. (*Mr. Holland.*) Have you noticed whether the miners frequently catch cold?—I do not think they do particularly; they are perhaps rather liable to consumption in this neighbourhood.

14,657. As well as the miners' complaint?—Yes.

14,658. Is it the younger miners who are liable to consumption?—Yes; I think that five or six may have died during the last dozen years belonging to Rodderup Fell, who have gone off in consumption at about 24 or 25.

14,659. Out of what number?—About the number which we generally have. I do not think that more than about six men have died from common consumption in perhaps the last 10 years.

14,660. Out of how many men?—Say an average of 100, and we have always a large proportion of men in our mines. They are principally young men. I think that we have generally more young men in our mines in proportion than they have in most of the others. We do not take any men underground under 20.

Dr. Charles Arnison.

14,693. (*Chairman.*) In your experience are there many now working in mines who are affected with what is termed the miners' disease?—There are a great many in this district.

14,694. At what age should you say that it first shows itself?—It varies considerably, but I think for the most part at about 30 it manifests itself; but persons of robust constitutions resist it longer.

14,965. Have you any cases now under treatment?—I have none but some chronic cases. Being a general practitioner, there is a medical man appointed for the miners in this district, and of course he has the greater part of the practice; he resides at Nenthead.

14,696. But still you have many cases?—Yes; I have several cases.

14,697. Do you ever have a post mortem examination?—No; we have no post mortem examinations in this district; there is a great objection to that sort of thing here. I am very sorry that it should be so, as I think that that might throw considerably more light upon the subject.

14,698. By what do you think that this miners' disease is occasioned?—The impure atmosphere of the mine, bad air, powder reek, aggravated by particles of dust constantly floating. Cold predisposes to an attack.

14,699. (*Mr. Holland.*) Do you mean catarrh?—Yes. Then there is often a sort of irritation of the mucous membrane of the bronchial tubes; the dust irritates the air cells, and of course one attack after another keeps up a constant irritation, and it ultimately settles on the bronchial tubes

14,700. (*Chairman.*) Do you think that bad air predisposes them to it in any way?—I think that it has an effect most decidedly.

14,701. Have you ever observed the expectoration of the men?—Frequently.

14,702. Is it much impregnated with dust?—It is.

14,703. Have you ever advised the man who have come to you not to go back to the mine?—Frequently. In some of the mines they are in the habit of taking them for out-door work, and after they are in a certain stage I recommend them to be employed as out-door labourers, which has a beneficial effect upon them.

14,704. Have you ever known a man when once affected recover completely?—Never.

14,705. Then should you say that they die earlier than other labourers in consequence of this disease?—They die considerably earlier. If you were to take 60 or 70 of the miners in the district, I should think that 17 of them would die before they were 50 years of age; of course I cannot speak with any degree of accuracy to that.

14,706. (*Mr. Holland.*) Is it rare for them to survive 60?—Yes; it is not common for them to survive 60.

14,707. And they are old men at 50, I suppose?—They are.

14,708. Do you consider this disease completely distinct from phthisis?—It is different from phthisis, I think, in many cases, inasmuch as there is generally considerably more difficulty in breathing, although the pain is very trifling; there is merely a stitch in the side, and a common blister or mustard plaster removes it. I often find a gentle emetic and mild expectorants beneficial to them in the early stages; they do not bear active treatment at all.

14,709. Is the expectoration very adhesive?—It is.

14,710. Like that of asthma?—Of much the same character, I think.

14,711. Is it ever purulent?—Occasionally, in the latter stages.

14,712. In the earlier stages also?—Not generally.

17,713. Is hæmoptysis common?—You meet with it occasionally, but it is not very common.

14,714. Is it uncommon?—I cannot say that I have met with it often.

14,715. What do you mean by hæmoptysis; merely a streaking of blood?—Yes.

14,716. Is there any liquid blood with it?—I cannot say that that is common.

14,717. Can you say that the spitting of liquid blood is uncommon?—I cannot say that it is common.

14,718. Do you ever find cavities?—Yes.

14,719. Where?—In various parts, but I think under the right clavicle.

14,720. Is that common in men of 40 and upwards?—I think it is.

14,721. You have cases of consumption, of course?—Yes.

14,722. Is there much noise of respiration of the bronchial tube?—Yes.

14,723. As if it were contracted?—Yes.

14,724. Is that common?—It is common to have a wheezing or something of that kind.

14,725. Is it universal in miners' complaint?—Seldom if ever without a wheezing.

14,726. The disease is very slow in its progress, is it not? —Very slow, but there is a difference in cases. In some cases they run their course rapidly, in others they linger on for two or three years.

14,727. Is it not a common thing that they linger on for years?—It is.

14,728. If a man changes his employment and works above ground, may he continue ailing a long time without getting worse?—They do

14,729. A very long time?—Yes.

14,730. That very rarely happens in common consumption?—No, it does not happen in common consumption, but in miners' cases it does; there is not nearly so much warning in common consumption.

14,731. Do you think that they suffer much from the powder smoke?—I think that that renders the air still more impure

14,732. That has not come much under your observation, perhaps?—No, I have not been much in mines. There is one thing I think with regard to the miners here, that a little more attention to ablution would be very much in their favour.

14,733. (*Chairman.*) Is there any provision for washing the men coming up from the mine?—I am not aware of any, but I would suggest that something of the kind should be adopted, which would be very beneficial to them.

14,734. (*Mr. Holland.*) Do you mean to recommend washing the whole body, bathing, in fact?—I do most strongly. It would be a most important protection.

Dr. Railton Gill.

14,739. (*Chairman.*) Have you observed any disease peculiar to miners?—Yes, I have observed a form of bronchitis, with a pigment or secretion from the lungs, and that pigment which they secrete from their lungs seems to increase with the time that they have been working in the mines.

14,740. Do you observe that in young men; at what age have you first observed it?—I have observed it after they have been from 20 to 30 years in the mines, sometimes they may expectorate earlier, but the disease to which they are subject appears not to be fairly established until they have been from 20 to 30 years in the mine.

14,741. At what age, at 40?—40 frequently, and sometimes before that.

14,742 At what time do they go to work in the mines here?—Some as early as 15 or 16 years of age; before they are half grown.

14,743. Do you think that those who go earlier to work are more liable to that disease than others?—Decidedly so; they have not the power of resisting it as much as men would do whose constitutions are more formed. Some men have the power of resisting disease far more than others.

14,744. What is the first symptom with which it developes itself in your observation?—Weakness of the frame, debility, attended with more or less of dyspnœa, difficulty of breathing, cough with expectoration; in fact, a form of bronchitis.

14,745. By what do you think that that is occasioned? —I think it is occasioned by the deposition of carbonaceous matter in the lungs.

14,746. Is there any from dust?—Yes, black dust, dust mixed with carbonaceous matter, the consumption of gunpowder. They blast all their rocks here, and form a great deal of dust, besides what is the residue of the burnt gunpowder, and candles as well. Lamp black, very likely, is another of the articles mixed with the dust.

14,747. Is there anything in the air to affect them?— There is an atmosphere deficient undoubtedly in oxygen, and loaded very probably with carbonaceous matter or carbonic oxide.

14,748. Have you ever seen a case where a man has been affected completely cured?—Yes, I saw an old man to-day in the workhouse who was willing to come down here and show himself as a perfect case of cure; he wrought for 30 years in the mines, and he is now living, being above 80. I asked him how it happened that he had lived so long; he said that he had not done anything for the last 20 years, but he said, "I got rid of it all about 20 or 30 years ago." I said, "You got rid of what?" "I got rid of a great deal of that black spit." In fact, instead of its combining with the tissue of the lung, he got it expectorated, and then he got rid of the true source of the disease.

14,749. Had he gone back to the mine to work?— No, he is now in the workhouse, and has been for 20 or 30 years.

14,750. Since he has been in the workhouse he has got rid of that expectoration?—He has got perfectly clear of it He has had a slight attack of cold or bronchitis lately; he has been under my care, but there is no expectoration of the black pigment, and I was rather surprised, he being an old miner.

14,751. Would that expectoration appear for some time after a man has left the mine?—It sometimes does not make its appearance for 20 years after they have been working in the mines, and then when their vital power becomes deficient they begin to get the bronchitis, and the exudation of this black pigment from a diseased mucous membrane.

14,752 So that after they have left working in the mine for 20 years they still spit up this black pigment?—Yes, if they lived 100 years they might spit it, it is what is united with the tissue of the lungs.

14,753. Supposing this disease shows itself after 20 years, how long will that black spit continue after that?—It may continue during the whole life.

14,754. Have you any case which you could show where a man is spitting that black stuff?—There is one man who I believe is not able to come here. He is spitting up occasionally that black spit, but mingled with three or four other secretions from his lungs, and he has likewise for the last two years been subject to hæmoptysis, consequently there is very probably a good deal of hepatisation or solidification of the lungs.

14,755. How long is it since he has been working?—He has been working in the last two or three years in the Rodderup Fell low level, which I beg to tell you is a very serious place indeed.

14,756. Have you any cases in that low level where the men are now affected?—I cannot quote the cases, but when they consult me I frequently ask them where they have been working. I lose sight of them for the time being from an attack of bronchitis, and it is only when they are dying that the thing perhaps becomes sufficiently notorious to attract one's attention. But I have had repeated cases of even young men before 40, and in fact before they have really got, you may say, to their full growth, dying from that low level in this neighbourhood; a place called the low level at Rodderup Fell. Sometimes it brings on tubercular disease before a spurious form of melanosis or the black degeneration takes place; they die sometimes of tubercular disease by its concomitant effects on a weak constitution.

14,757. (*Mr. Holland.*) Is there any doubt that miners' bronchitis is quite distinct from phthisis?—It is quite a distinct disease.

14,758. In fact with hardly any resemblance except cough, expectoration, and wasting?—No resemblance at all, excepting some cases of consumptive individuals, and then they may have both, as in the case which I mention, where a man has had hæmoptysis and spitting of blood, and hepatification; he has likewise the black spit, which I believe is the primary cause of the disease.

14,759. Have you noticed whether true consumption is more or less frequent among miners than among the other population of the neighbourhood?—I do not think that it is more frequent.

14,760. Is it not less?—I think that it is less.

14,761. When miners are able to get work above ground who are suffering from this bronchitis, is the disease suspended?—It prolongs their life a while.

1,762 You attribute the disease, I think, chiefly to candle smoke and powder smoke?—Yes.

14,763. And dust?—And carbonaceous matter.

14,764. Do you not think that the gritty matter has to do with it?—I do not think that it has as much as the carbonaceous matter.

14,765. You think that the carbonaceous matter from the imperfect combustion of candles and the powder smoke are more irritating to the bronchial membrane than the gritty matter of the stone?—I do not think that perhaps they are more irritating, but I think that the two together are highly irritating, more especially when they get combined with the tissue of the lungs. This immediately irritating matter is expectorated, but the carbonaceous matter forms a black pigment in the lung and you cannot get rid of it, whilst the irritating matter is often expectorated.

14,766. Do you know the black spit of colliers?—I have seen it; it is nearly similar to what we have here.

14,767. But colliers very frequently escape any permanent injury?—They do.

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14,768. How do you account for that?—I cannot account for it except that the atmosphere which they breathe is different. A collier has a good appetite whilst a lead miner has a very poor one.

14,769. How do you account for that difference?—I cannot account for it excepting that the colliers have better ventilation.

14,770. Is not that a very satisfactory way of accounting for it?—Very likely; I cannot say, I have had no experience in the interior of coal mines.

14,771. If you knew as a fact that the collieries were very well ventilated, and we know what these mines are, would not you say that the difference of ventilation satisfactorily accounted for the difference of appetite?—I think so, the colliers get more oxygen to breathe and that is one reason why they have a better appetite; when men have a bad atmosphere to breathe their whole frame is depressed.

14,772. Are there instances of the black spit continuing for many years after the men have left their work?—Yes, many years.

14,773. Where does it come from?—It comes from the mucous membrane of the lungs.

14,774. Is it a secretion?—It is a secretion undoubtedly from the black lung.

14,775. Is it a stock of carbonaceous matter which they have laid in while they were working?—It may be a spurious form of melanosis which is capable of secreting this black matter; we have all forms of expectoration in some of those miners, I have sometimes seen three or four tinges or different kinds of expectoration, but the black is the most important and the most permanent.

14,776. Have you had any post mortem examination of a miner?—No; the people here are prejudiced against it.

14,777. Can you suggest any remedy to prevent the production of the disease?—Any suggestion which I could make would be to improve the ventilation—to let them have better ventilation in their mines, and to drive away this matter which they are breathing.

14,778. The avoidance of smoke?—The avoidance of dust from the combustion of gunpowder.

14,779. Do you attribute it chiefly to gunpowder?—Yes. They work all their mines here with gunpowder, and after they fire a shot they go back to work in this atmosphere charged with gunpowder smoke.

14,780. Do they use very smoky candles?—They use candles.

14,781. Do they smoke very much?—I believe so. They are used in my own house, and I have noticed them smoke.

14,782. Would not the employment of some light which did not smoke so much as a candle be an important improvement?—Very great, I have no doubt of it. If you could prevent lampblack mixing up with other forms of carbonaceous matter in the mine, the consumption of gunpowder, and if you could get ventilation at the same time, a current of air through the mine, you would get rid of the cause of disease to a great extent.

14,783. Are the miners liable to catarrhs?—Very liable to coughs.

14,784. What is the reason of that; going home in wet clothes?—I suppose that one cause of their catching cold would be coming out of a heated atmosphere into cold air very often with wet clothes, but likewise from the irritation

14,785. But it is said that it is not a heated atmosphere, that the mines are very cool?—I mean to say that there is a great deal of difference between the temperature of the mines and of the external atmosphere. The men come out of mines perhaps at 60° (I do not suppose they are ever much warmer or colder than that) to breathe an atmosphere 20° or 30° of Fahrenheit below that and at freezing point, and I have known it here sometimes down to zero.

14,786. But not often?—Not often. I know that they must come out of an atmosphere of from 50° to 60° to an atmosphere frequently down to 12° or 13° of Fahrenheit; therefore they must be liable to catch cold.

14,787. Do you know as a fact, from your own observation, that they do catch cold very frequently?—Yes.

14,788. Do you not think that that has something to do with the production of this bronchitis?—No doubt about it; it brings on catarrh.

14,789. Dr. Arnison has suggested much more frequent washing, baths, as a great protection against that; do you concur in that opinion?—They are a particularly clean set of men.

14,790. I do not think that he meant so much for the sake of cleanliness as of tempering the skin, and rendering it less susceptible of cold and damp?—I cannot say about that.

14,791. (*Mr. Kendall.*) You have never been underground yourself, have you?—I have been occasionally, but never much in the mines.

14,792. Not enough to offer an opinion of what you saw there; you only hear that the ventilation is bad?—I hear that the ventilation is bad, and I see the men who consult me.

14,793. And you hear that the powder smoke lies a good deal?—I hear it and I see it myself. They tell me that they sometimes have to sit a good while before they can go up.

14,794. All that you can judge of is the effects, but the causes you cannot speak of except from hearsay?—I cannot judge from my own personal observation.

14,795. From what you have seen you have no doubt that there is an unhealthy breathing of powder smoke and other carbonaceous matters?—Yes. I would refer the Commissioners to a very important paper by Professor Virchow, on the pathology of the miner's lung, also one by Dr. Thomson, of Perth, on melanosis of it; both those papers are published in the Edinburgh Medical Journal for January to June 1859. I would likewise refer the Commissioners to a letter by myself on the same subject, published in the same work for July to December 1858. In that letter I state: "In the lead mines of Alston Moor the work is "almost entirely blasting with gunpowder, and the effects "on the lungs are such as invariably produce dyspnœa, "with occasional attacks of bronchitis, with expectoration "of mucus tinged with carbonaceous matter. This tint "varies from a grey to a black colour, and the symptoms "vary in severity according to the time spent, generally "from 20 to 30 years. On approaching the latter period "however the vital power is weak, the pulse frequent, "more or less anorexia, dyspnœa, asthenic bronchitis, with "the usual signs of emphysema are present; the expectoration when advanced, grey or black, but mixed with "muco-purulent secretion from the congested mucous "membranes, the strength rapidly declines, and death "occurs almost in the same way as in tubercular consumption with the exception of the symptoms arising from "the frequent complications of the latter. Such was "likely to occur in the case now to be mentioned."

Mr. Joseph Rodam, Bentyfield Mine.

14,817. (*Chairman.*) Are there any men working with you who are affected in their breathing?—Yes, there is one.

14,818. Is he able to work at all?—Yes, he can work quite well, but still he is a little affected.

Mr. Josiah Rembry, the Derwent Mine.

14,988. (*Mr. Kendall.*) Do you know much of the agriculturists in this neighbourhood?—No; I do not.

14,989. You do not see many of the agricultural labourers?—I see them occasionally.

14,990. Are they a healthy set of men?—Much like other districts.

14,991. Are they a healthier set of men than your miners?—These have a fresher appearance.

14,992. You say that Cornishmen sometimes come up here to work?—We have several.

14,993. Were they miners before they came here?—Yes.

14,924. Taking them as a body, are the Cornish miners that you have seen more delicate than your miners here?—No; I do not see much difference.

14,995. Have you inspected Cornish mines?—I have.

14,996. Taking the body of Cornish miners and the body of miners here, which should you say, from your observation, is the healthiest body of men, or do you see any difference?—I think there is a difference.

14,997. Which are the best?—Those in the north.

14,998. They are healthier men?—Yes, especially after a certain age.

14,999. A Cornishman at 40 is an older looking man than a miner of this district?—I should say so, although I have been in the north upward of 20 years. I have been in Cornwall sometimes. I was there only 12 months ago.

15,000. To what do you attribute the difference which you think there is between the two?—Extra fatigue, probably; having deeper mines to contend with in Cornwall than in the north.

15,001. Do you think that as a body of men they work harder than the men here?—I should think that if there is any difference the Cornishmen would work the hardest.

15,002. (*Mr. Holland.*) Do you know the Alston Moor miners?—I do.

15,003. Are yours better or worse than they, or much the same?—Much the same, although the Alston Moor miners are superficial workers. I dare say they have long drifts, but they have nothing much in depth, I believe.

15,004. Is there any marked difference in health between the miners who come from Alston and your own miners?—No; I cannot see that there is a marked difference.

15,005. They are much the same?—They are.

15,006. Do your miners, as a class, remain in good health until they are 50?—Yes, our men generally enjoy good health. Their general health is good.

15,007. Is their wind good and sound till 50 as a class?—No; I cannot say that.

15,008 Is it so till 40?—Some are affected.

15,009. I am speaking of them as a class?—I should say not the whole.

15,010. If you took 100 miners of 40 would you find 50 bad in the wind?—Perhaps affected.

15,011. And at 50 very much affected?—Some.

15,012. Would they find a difficulty in getting up a hill at 50?—Probably.

15,013. Is it the case that the miners here, as at Alston, die of chest disease to a large extent?—Some have that complaint, but I am not aware that any die very young from it.

15,014. Do not a large number of those who get above 40 die of disease of the chest?—I am not prepared to say. The medical man will answer that question better than I can.

15,015. Do your miners suffer a good deal from powder smoke or candle smoke?—They do not suffer much from either They suffer more from candle smoke probably than they do from powder smoke, because the candle is a constant companion, and they cannot avoid inhaling the smoke from it.

Mr. THOMAS MORPETH, Derwent Mine.

15,070 (*Chairman.*) Are any of the men under your charge affected in their breathing?—We have some affected in their breathing.

15,071. What is the cause of that?—Very probably there are some very old chaps, 68 years old; if a man has ever been in a mine it is possible that he will be affected in his breathing.

15,072. But you think that the young men are not affected by it?—Not that I know of.

15,073. At what age are they affected in their breathing?—Some young men are asthmatic and are affected before they get old.

15,074. Then do you think that there is nothing in the work of the mine which causes the men to be affected?—I do not say but what there is; it is not so pure as on the surface.

15,074. What is there in your opinion to affect them?—It may be the powder, rock, or something else; I cannot give you an actual answer.

15,089. I suppose, taking the miners as a body, you do not consider that they are quite as healthy as the agriculturists?—No; I do not think that they are.

15,091. (*Mr. Kendall.*) Is the health of the men generally good?—Yes.

15,111. (*Mr. Holland.*) Has there been any improvement in the health of the men in the last ten years?—Yes, there must be, I think.

15,112. Have you noticed that there is?—Yes, I believe that they are a good deal better.

15,113. Is there a decided improvement?—Yes.

15,114. Are they less touched in their wind than they were ten years ago?—They are not touched so much as they were ten years ago.

Mr. JOHN MADGIN FARBRIDGE.

15,119. (*Chairman.*) Have you observed during that time any particular disease by which miners are peculiarly affected?—Diseases of the chest.

15,120. Is that in your opinion occasioned by the description of their work?—Yes, to a certain extent.

15,121. Can you state shortly the symptoms of that disease to which the miners are more liable?—Bronchitis, difficulty of breathing, more particularly upon any exertion.

15,122. Cough?—Cough with expectoration.

15,123. Is that expectoration coloured?—Frequently.

15,124. (*Mr. Holland.*) Is it black spit?—It is more of a lead pencil slate colour.

15,125. (*Chairman.*) Have you ever known instances where it has been vomited?—Not unless there was general vomiting from the stomach; but an excess of cough creates vomiting.

15,126. Then do they expectorate that?—Yes; and it does them good.

15,127. It relieves them?—It relieves them very much.

15,128. Have you ever seen a case where after a man has left off work in a mine for some time, that coloured expectoration has continued for some time?—Yes, generally so.

15,129. Did you ever have a post mortem examination?—Not in this country.

15,130. (*Mr. Holland.*) It is quite certain that this miners' complaint is distinct from common phthisis, is it not?—It frequently terminates in phthisis.

15,131. Is it quite distinct from common phthisis?—Yes; it is lead asthma.

15,132. You mean lead miners' asthma, do not you?—Yes

15,133. To what causes do you attribute it chiefly?—The principal cause is the under surface working.

15,134. What immediate effect has underground working upon the health, is it the dust?—Principally.

15,135. Do you think that the smoke has much to do with it?—Yes.

15,136. The candle smoke or the the powder smoke?—The gunpowder smoke.

15,137. More than the candle smoke?—Yes.

15,138. Is the disease very slow in its progress?—Very slow.

14,139. Does it come on very gradually?—Very gradually indeed.

15,140. At about what age do you see it at first?—Generally between 35 and 40.

15,141. Not generally before 35 or after 40?—Not unless the miner is predisposed to consumption.

15,142. I am now speaking of miners' asthma, that seldom comes on before 35?—Yes.

14,143. And generally before 40?—Yes.

15,144. When do they generally become very ill with it; is it several years after its commencement before they become very ill?—Few miners are able to work after 50.

15,145. Is that the case at the present time as it was some years ago?—Yes.

15,146. We have been told that the miners are much more healthy than they were ten years ago?—I think so; that is from the improved mode of ventilation.

15,147. Is ventilation improved generally in the mines?—I think that in our district it is.

15,148. Does this complaint come on at a later age than it did ten years ago?—I have not noticed that.

15,185. (*Chairman.*) When the men come to you do they complain or imagine that they have got their illness from any work in which they are engaged?—Frequently they do.

15,186. What do they complain of generally?—Cough and shortness of breath.

15,187. Do they consider that they have got it from working underground?—Yes.

15,188. From working in any particular level?—Yes, frequently.

15,189. What do they complain of in that level as affecting them?—The deficiency of pure air.

15,190. Do you recommend them to go back to their work or to abstain from their work?—I recommend them to keep out of it as much as they can; they generally go back.

15,191. If such a man goes back to the work, do you think that there is any injurious effect?—Yes, I do.

15,192. Have you ever known any man once affected recover completely?—If they were young and left when the first symptoms made their appearance and went to another occupation, they got better.

15,193. But if they have gone back to the mine, what has been the consequence?—An increase of the disease.

15,194. How long do you think that a man could work in the mine after he was so affected before he was obliged to give up altogether?—They generally give up before 50; it is an exception to get up to 50.

15,195. At what age have those whom you have seen generally been obliged to give up their work?—Between 40 and 50.

15,196. Have you any cases now which you could name to us of men who are working in the mine who are still affected?—There are some here whom you will see to day.

15,197. Are those patients of yours?—No.

15,198. Have you any patients of yours now working in the mine?—I have.

15,199. About how many should you say?—About half a dozen.

15,200. Do you mean working in the Derwent mine?—Yes; I am connected with no other mine.

15,231. Do you keep any record of the cases which come under your notice?—No.

15,202. Are the names of the men not put down in any book?—No, I do not keep any account, with the exception of giving them certificates for their relief when they are off work.

15,203. How many certificates do you suppose you have given in the last month? I do not know exactly; perhaps six or seven or eight, I cannot say; I do not keep an account.

15,204. Can you give us the names of those men?—I should think that the bulk of those who got certificates for the last month have gone to work again; they are not under medical treatment; as soon as they go to work they cease to be under my treatment.

15,205. Have you any miners now who are off work altogether and are under medical treatment for miners' disease?—Yes.

15,206. Do you know about how many?—I know of three.

15,207. About what age are they; are they old men?—Somewhere about 50.

A Miner.

15,209. (*Chairman.*) You are affected now in your breathing, are you not?—Yes, but I am working at my bargain. I walk nearly three miles to labour in the morning between my place and the mines.

15,210. Is it in a wet part of the mine that you are working?—Yes; it is so now.

15,211. Do you change your clothes when you come out of the mine?—Yes.

15,212. Where do you do that?—At the dry that we have convenient to the mine.

15,213. Do all the men change their clothes there?—No; they do not. Only the men who are wet change their clothes there. The others go to their own homes.

15,214. From what cause do you suppose you became affected in your breathing?—I cannot say. There is many a one affected that has never been in a mine.

15,215. Have you not sometimes worked in bad air?—There is a difference in the air, but there is a stour that will come out that will affect your breathing when you are drilling. That will arise from the stone, and that affects the wind.

15,216. Do you get much of that into your mouth while you you are working?—No. We do not find that much.

15,217. Do you not spit it out if it gets in?—Yes. We spit it out, a part, or else we should soon be done, but not all at the time we are working.

15,218. How long does the spitting continue after you have left off working?—Not long; we get clear of it when we get home.

15,219. Are there some men younger than you who are affected in the same way?—I dare say they will be.

15,220. Do you happen to know anyone now who is working in the mine whose breathing is affected, and who is under 50 years of age?—I do not know one. I cannot name one.

15,221. Did you ever work in bad air?—Yes. I have wrought in all kinds of air.

15,222. Did you ever work where you were obliged to put the candle on one side that it should keep alight?—No. I never would go there; that is not a place for a man to work in, that is where the damp strikes in.

15,223. The men sometimes do work in that, do they not?—They do, but they had better have gone home.

15,224. But they sometimes work in it?—They cannot when the candle is that way. They cannot work in the mines in that way: they cannot bore their holes, you see, and they cannot breathe.

15,225. How long is the smoke clearing away where you are working now?—The wind is like to blow your cap off your head. It is going directly near where we are working now.

15,226. In some places does the powder smoke hang about a long time?—Yes; but there is a difference of places; it depends upon how they are ventilated at the mine.

15,227. If you are putting in a rise will not the smoke remain there until the rise be carried up to the upper place to which it is going?—The smoke will hang there till she be through.

15,228. How long will it hang about there?—I cannot say. There are different places for that.

15,229. How long have you seen it hang about?—I am sure I cannot give it a name.

15,230. Have you seen it hang about for half an hour?—Yes, and then we smoke our pipe till it gets off.

15,231. Then you go and sit down and smoke your pipes for half an hour till it clears away?—Yes, when we are in places like that.

15,232. Do you ever have to smoke for an hour?—I hardly know that; I will not say that. We work by measure; we must have our measure.

15,233. (*Mr. Davey.*) Has there been any improvement in the ventilation within the last 10 years in the Derwent mines?—They are well ventilated.

15,234. Has there been any improvement or is the ventilation better now than it was 10 years ago?—I do not know. I have been in it for 10 years, and I think it will improved. There are some levels getting forward and shafts sunk and things of that sort, but they are not like a coal pit.

15,235. You have more winzes and rises through the levels than you have in a coal pit?—Yes; and we have good ventilation that way.

15,236. Where you used not to have?—Yes. We are underneath; it used to be all up and down, but we get underneath now. We work up now. It used to be formerly down and lifting the work up, but now it falls down where the shaft is being sunk down deeper. It used to be to lift up by hand to the shafts. They have become quite improved in my time.

15,237. You say that you suffer a good deal from the dust in boring?—Yes.

15,238. Why do you not put water into the holes?—In every situation you cannot do that. When you are boring upwards you cannot put water in.

15,239. Do you usually put water in if you are boring down?—Yes; not always, but nearly so, for our own convenience. We can bore as fast again with water.

15,240. (*Mr. Holland.*) Is it common for the miners to suffer from the same disease that you have?—I dare say it will be.

15,241. Do you not know whether it is so or not?—I do not know for all men. I have seen some.

15,242. Is it common for a man below the age of 40?—I cannot say the age. I had nothing of it at 40.

A Miner.

15,245. (*Chairman.*) How old are you?—I was 50 last January.

15,246. Are you at all affected in your breathing?—Yes.

15,247. How long is it since you have been so affected? As near as I can say, about six years.

15,248. How did it first come on?—Something similar to asthma.

15,249. Did it come on with a cough?—Yes.

15,250. Have you taken any cold?—No; it was not by cold. It was just something like cough, as if I had some phlegm that I wanted to get rid of. After that you feel more freely to breathe.

15,251. Can you at all explain how it was brought on?—I cannot explain that; but I had what I thought a reason, I may be wrong. But I was working in an end where all the draught of air was coming, and all the men were working before us, and the smoke all met us in the face. I had been working in a place before which our master considered the worst place in the mines. I did not feel affected in it; but after we came to the place I have mentioned, where that smoke met us and the dust, I felt that it affected me.

15,252. Was it considered the worst place on account of the bad air in it?—Yes; it was what we call bad air. There was no communication to it; it was a rise that we were putting up to cause air.

15,253. When you are putting up a rise the air is bad, is it not, until you effect a communication?—Of course, it must be.

15,254. When that is the case, does the candle burn badly?—Very poor; we have to keep it in by holding it slanting.

15,255. Must that always be the case when you are putting in a rise, or sinking?—It is not always the case; it sometimes happens that the air cannot be got by the boxes, and sometimes we get a water-blast. Sometimes there is a little machine, something like what we call a fan-blast, and that is used to get air to us.

15,256. When there is nothing used, the air is bad?—Yes; it is very bad. We had a fan blast in that place, but there was no good air. When that fan-blast was put there, the air that came was not good.

15,257. It is important, is it not, that the fan-blast should always be where the air is good?—Of course; but it cannot always be got.

15,258. Could they not put in a water blast?—Sometimes they cannot, and sometimes they can

15,259. They have not always water?—No; and they have not perhaps a convenience for getting that water away when there is no pumping machine, or else the water-blast is the best, decidedly.

15,260 Have you often worked in those rises where the air has been bad?—I have worked in three that I remember, which were considered the worst in our mines. I have wrought in what we call plate drifts, and they are the worst for affecting the wind. I worked for four years there They are what might be termed wet.

15,261. And did not that affect you at all?—Not in that day. I was younger then.

15,262. Did it not produce any unpleasant sensation at the time?—Yes, it did, because the plate dust lies more heavily upon you than any other dust, and after you get out you feel that there is a general clogging in your breast, till after a little exercise, and then you get rid of it.

15,263 Did it affect your knees at all, or your head?—The head is generally affected if the air is poor, and so are your knees

15,264. Do you walk out by the level from the mine, or have you to climb up?—The general way in our mines is climbing, in the part of the mine that I work in

15,265 What is the greatest distance that you have to climb now?—100 fathoms.

15,266 Does that affect you very much?—Yes; but I go there every day, notwithstanding

15,267 How is the ore taken from there?—It is taken out by machines. The water-machine draws the ore.

15,268. There is no machine for the men to go up and down by?—No.

15,269. There are only ladders?—No.

15,270. Are the ladder-ways separate from the air shaft?—They are both ways in our mine. We have one at one part of the mine, and that is the engine-shaft, and we have a separate footway by the side of the drawing shaft.

15,271. Are the ladder-ways separated from the drawing shaft?—Yes.

15,272. How are they separated, by wood?—The drawing shaft does not come in at all, but in the pumping shaft they are separated.

15,273 Is the footway separated by a brattice?—They are not separated by bratticing entirely all down, but there is one part in the mine, a new one that they are making now, where they are making an entire separation; there is a brattice all the way down the footpath I am what they call woodman to the mine; I am in all parts of the mine.

15,274. You do not now work as a miner?—No.

15,275 I suppose you could not perform the labour of a miner?—Yes, and do the same thing as ever I did; as to following the waggons to the tramway, that I suppose I could not do, I am too short in the breathing; but we say generally that it suits the young men.

15,276. Is any place to be seen now, where the miners are working, and where the candle has to be put to the side?—Not in the part of the mine that I work in, or not to my knowledge, there might be a place.

15,277. Have you the charge of all the timbering in the mine?—Yes; there is another man with me in my part.

15,278. Is there a man whose business it is especially to look after the timber?—There is a master-man, and he is in every day, and he directs us, we have a special order from him, that if we see any failing to go direct and put it to rights.

15,279. What are the lengths of the ladders?—They vary all the way from 12 to 18 feet.

15,280. At the bottom of the ladders is it boarded over?—Yes, and made all quite close; there is just a hole so that a man can go through.

15,281. (*Mr. Davey.*) Is it at Jeffery's shaft that you work?—No, I do not work there; it is called Ramshaw shaft.

15,282. If you come up from underground, there is no necessity to go up direct by the footpath; cannot you go up through the winzes?—We can; but still we must have climbing.

15,283. But not continuous climbing?—No, not straight up.

15,284. Do the men generally come up by the shaft, or by those winzes?—That just depends upon how the men are working; in the part where I am our pumping shaft goes down, and she is driven away some 100 or 150 fathoms from that, as near as I can say. I do not say that it is exactly so, because I never measured it, but it is about that, from that we have a drawing shaft, and then she is driven away from that again. There are drifts to come back to the stepways or footways; but we always go to the footway, or out at the engine-shaft at Ramshaw

15,285 Are you a native of this place?—No, I came from the south when I was six months old; I came from Yorkshire

15,286. Do you consider that any improvement in the ventilation of the Derwent mines has taken place within the last 10 years?—I think there has been some improvements; I have wrought in them all my life, and I never worked for any other company

15,287. Had you more men ill 10 or 15 years ago than you have now?—I never knew the men very much affected in our mines; after they come to my age they are all more or less affected

Mr. Joseph Denning.

15,383. (*Chairman.*) Are the mines to which you refer all lead mines?—Yes. I am also a colliery owner.

15,384. In the mines which you are referring to have you observed that the men working in them suffer at all?—I think not; not generally. Of course, I do believe that they sustain more or less injury. I do think that.

15,386. Do you think that they sustain more injury than from working in coal mines; Yes, I think so

15,386. In what way do you think the miners are injured?—I presume that it arises from impure air and from the nature of their work; that is, from the dust that necessarily arises from drilling the holes, and from the nature of the work generally, from its dirty character. Of course they cannot stir the material, as it is like all matter, without making more or less dust, and that being necessarily inhaled into the lungs will do them injury. Generally speaking, you find the miners a little injured in their breathing, and even young men, who I fancy are not predisposed to it, but they become so from the nature of their work.

15,387. At what age do you think the miners generally become so affected?—I fancy that if they work for a few years they will become affected. Indeed I know several young men, or at any rate men of about my own age, that are almost breathless They cannot walk scarcely 100 yards without being affected, and of course they attribute, I fancy, that defect in their breathing most particularly to the nature of their employment. Six or nine months or 12 months are quite enough to work in one of these bad places to produce that result.

15,388. I suppose working in bad places means driving an end or rise without much air?—Yes; without having proper ventilation.

15,389 Is it not necessary when driving in order to effect a junction with two levels to get ventilation?—Yes, that is done occasionally of course, but where there are other mechanical contrivances wanting they are obliged to do it.

15,390. Are the miners paid more for performing their work under those circumstances?—There is no mistake about that. The men must have more wages for fewer hours and less labour.

15,391. When they are driving any of these close fore-ends they are paid more and work less?—Decidedly so.

15,392 That is rather an inducement, is it not, for the young men to undertake that kind of work?—I presume that for the most part, young men are put to that kind of work; indeed it is generally work that is done in an emergency, and they employ young men upon it in order to expedite the work; at least that is, I think, the general object for putting them upon it.

15,393. They do that work to the injury of their health?—Yes, sometimes people are, and in fact you find it frequently so, careless as to these consequences.

15,394. In Alston Moor are there any of these places where they have driven?—I think not, not particularly; I could not mention one instance specially, but I fancy that that sort of thing occasionally arises in many of the mines in the district; but at the same time I presume, as far as I know the disposition of the parties, that they do their utmost to remedy that state of things

15,395. When they are sinking deeper, is there any alteration made in the dues; is there any reduction made in consequence of these deeper workings?—Yes, very recently here in this district, a reduction has been going on over the last few years, but more generally in the last two years, and that was given in consideration of their putting a larger proportion, or at least a certain proportion, of men underground by way of making new trials; for, it is generally understood, I think, in the district of Alston Moor, that the veins are about exhausted, so far as the veins that have been already discovered go, that they are pretty well worked out; and now they are making efforts to get down deeper, and of course the deeper down they go, the worse ventilation there is; and until the excavations are made below, so as to produce a proper communication backwards and forwards with the air, the men will necessarily suffer more or less.

15,396. The men, I presume, are likely to suffer still more, the deeper the excavations are made?—Unquestionably; but at the same time they are not deep mines.

Mr. John Ridley, Coalcleugh Mine.

15,484. (*Chairman.*) Should you say that the men are generally healthy?—I think they are.

15,485 Have you any men at all affected in their breathing that you know of?—Some of them after they arrive at about 50 years of age or so are affected a little. There may be some affected a little earlier, but there are not many.

15,547. (*Mr. A. Bruce.*) You say that you have 67 men above 40?—Yes.

15,548. How many of those do you think have the asthma?—I really cannot answer that question.

15,549. It is not to be expected that you can give the exact number, but should you say one-third of them, or half of them?—I think that I would not go beyond one-third.

15,550. Do you mean to say therefore that two-thirds of the men leave off working as miners from old age, without having any particular disease affecting the breath?—I would not like to say that; they sometimes leave off and go to something else; some of them fall in for something else after they have wrought in the mines; they work as long as they are able to work at the usual work, though they are not quite as well as they were; they may be affected a little; we call them bad in the wind, that is what the miners call it.

15,551 In your opinion do two-thirds of the more elderly among the miners leave off without anything being the matter with their wind?—I scarcely understand what you want me to answer.

15,552. You say that one-third of those 67 above 40 have their wind affected?—Yes.

15,553. Then I ask you whether two-thirds of the men who leave off working from old age, leave off without anything being the matter with their wind, except such as would arise from the weakness of old age?—Perhaps many do not leave off unless they are affected a little in their wind.

Mr. William Hewitson.

15,590. (*Chairman.*) During those 14 years have you seen much of what is called in other places miners' disease or shortness of breath?—I have seen a good deal of that.

15,591. How are the men affected?—At first it begins with a little shortness of breath—perhaps a little tickling cough; or a little huskiness in the throat.

15,592. Is it a sort of bronchitis?—It has scarcely arrived at that stage then; it does not go on to that until some little time.

15,593. When you have found that the case, have you ever seen it quite cured when it has begun in that way?—I do not think that I have ever seen it quite cured. Generally matters get worse, unless the men come out, and go to some out-door employment; then I have seen cases remain stationary for a long time, but if they continue to work they get worse as a rule.

15,594. At what age, generally speaking, should you say that they are more affected?—They begin to be affected soon after 40, in a general way; after 50, of course they are more affected.

15,595. Have you ever formed an opinion as to the cause of that?—The opinion which I formed was that it was owing to the dust in the mines settling upon the bronchial tubes, the windpipes, causing irritation and congestion there, and gradually, perhaps, leading on to inflammation and thickening of the bronchial tubes, that is thickening of the lining membrane of the tubes.

15,596. Does it ever arise from poor or bad air?—I am scarcely in a position to say that.

15,597. Do the men, when they come to complain of first feeling it, describe to you at all the place in which they have been working?—Yes, they frequently say that the air was bad.

15,598 What do you think that the men themselves attribute it to when they come to you?—I think that they attribute it to what I have just said, the collection of dust owing to the mines perhaps not being so well ventilated. Of course when the mines are well ventilated they do not feel so much of the dust. There is a current, and it is swept away.

15,599. Would the ventilation take away the dust of the stone or material in which they are working?—I think it would perhaps be more likely to be blown away.

15,600. Do you think that anything arises from candle smoke or powder smoke?—Yes, I think that that is also deleterious.

15,601 Have you ever observed the spit of the men?—Yes, but out of 100 men whom I examined on the 1st and 2nd of this month I found that scarcely one man would complain of any expectoration, although I am aware that nearly all the men do expectorate after working a few years in the mines.

15,602. (*Mr. Austin Bruce.*) How many of the 100 were affected with difficulty of breathing?—I have certain tables which I marked down at the time. Under 30 years of age I found only five per cent. affected with incipient asthma.

15,603 How many did you examine?—I examined 100. At that ratio I found only five per cent. affected with incipient asthma under 30 years of age. Of course those 100 were men of all ages. Between 30 and 40, 20 per cent. will be found to labour under pulmonary disease of some sort. Between 40 and 50 years of age, 30 per cent. have decided asthma; 50 per cent. have asthma in the incipient stage, and 20 per cent. are free from disease. That is a greater proportion of persons free from disease than I expected to find at that age. Between 50 and 60 years of age all are affected more or less; about 60 per cent. are affected, but not to a great degree; about 40 per cent. are cases of greater severity. Between 60 and 70 all are affected more or less in their breathing.

15,604 (*Chairman.*) How does this asthma affect their general health?—For a long time it does not seem to affect them at all. In fact there are many cases of incipient asthma which are not brought under my notice perhaps for years; they may not come under my care until some attack of bronchitis or severe catarrh, or something of that sort, brings them to me.

15,605 (*Mr. Austin Bruce.*) Is the attack of catarrh much aggravated by asthmatic disease?—I should think that the catarrh aggravates the disease then existing; it is more likely to lead on to inflammation.

15,606. (*Chairman.*) Have you ever examined the men's spit especially?—I have frequently.

15,607. Is it black dust or carbon in your opinion?—I have sometimes seen greyish material in it, but in a general way it looks simply like mucus; and I put that question to nearly all these men, whether they had any expectoration, and very few would admit that they had any expectoration at all, and as regards the few that did admit it, all their explanation was that it was only like phlegm, by which they mean mucus, I suppose.

15,612. (*Mr. Austin Bruce.*) Have you observed any improvement in the men's health since you have been placed here?—I cannot say that I have.

15,613. Any change for the better or the worse?—I do no not see very much change in that respect, I have only the men's statement when they say that the mines are much better ventilated than they used to be.

15,614 Have you observed any difference in their health in consequence of that improvement in ventilation?—I have not.

15,615. Have you ever attended men who professed to have suffered from working in any particular close end?—No doubt I have done so, although I cannot call it to mind. No doubt some cases of that kind have come under my observation.

15,616 You do not recollect their complaining to you?—No, I do not.

15,617. Should you say that the life of a man was shortened in consequence of his employment?—I think so, decidedly.

15,618. To what extent as compared with the surrounding agricultural population?—I have not been able to ascertain that, but I have looked over the certificates of the cause of death for the last 10 years, of miners who have died in this district that I have attended, and I find that there were 72 deaths in the last ten years, and the united ages of these men amounted to 3,204 years, giving 44½ years as the average age of each miner in my district.

15,619. Have you compared that with any number of agricultural labourers?—No; I have not had an opportunity of doing so.

15,620. Do you believe that to be below the average of a similar number of agricultural labourers?—I think that it is below the average of agricultural labourers, but I believe that it is above the average age of miners generally.

I think that the average age of miners generally is rather below that.

15,621. Have you ever known any other mining population than in your district?—No. I lived at Allendale Town as assistant to Mr. Armiston, three years before going up into that district.

15,646. Do you consider the miners' asthma, at its commencement, a perfectly distinct disease from phthisis?—Quite distinct from phthisis.

15,647. You have no doubt about that at all?—Not the slightest.

15,648. Have you heard the men attribute injury to their lungs to breathing close air, or only to dusty air?—To close air and dusty air also.

15,649. Have you heard them attribute it to close air alone?—I have heard them complain of both very much; they were so mixed together that it was very difficult to distinguish.

15,650. Do you consider miners particularly liable to catch cold?—I asked these 100 miners that I examined, "Are you liable to take catarrh, that is to say, cold?" Only about 10 out of that 100 would say "Yes."

15,651. Then it would appear that they were less liable than men usually are?—Yes. I asked whether they were any more liable than the generality of men, and they said, "No."

15,652. Does that correspond with your own observation?—Yes, I think it does.

15,653. Does the asthma come on very gradually?—Very gradually; in fact, a man will labour under difficulty of breathing for 20 or 30 years, and the surgeon in the district, perhaps, will not know that he has such a disease.

15,654. How does it show itself at first; simply from difficulty of breathing?—Simply a little shortness of breath, and a little cough and huskiness.

15,655. I am told it is some time before large expectoration begins?—Yes, it is many years, perhaps, before that will take place; if a person is predisposed to chest affection, of course it makes a difference.

15,656. Is it generally a good many years before they become decidedly ill?—Yes.

15,657. Have you known men become rapidly ill from working several months in very bad close air?—That has not come under my notice.

15,658. I suppose I am right in assuming that you say that in almost all cases the disease is of very slow progress at its commencement?—Very slow progress at its commencement; unless a person has any lung disease, perhaps, or a weak constitution.

15,659. Such as tubercular deposit?—Yes, it is then apt to hasten on.

15,660. When the men are much affected in their lungs and get out-door employment, does the disease become suspended?—I have known cases where it has been suspended for a time.

15,661. For a long time?—For a long time. Their health improves very much as far as appearance goes. Instead of being pale and pasty-looking, as the miner generally is, they are ruddy.

15,662. If the get out-door employment they may live for many years asthmatic?—Yes.

15,663. Are they frequently able to get surface work?—Some who can afford it when they have grown-up sons will leave their employment and do little or nothing; they will, perhaps, just work about their ground at home, and they live on for many years.

15,664. Without getting rapidly worse?—Yes; I know one man of 77.

Mr William Montgomery.

15,705. (*Chairman.*) During the time you have been here, have several cases of miners come under your notice who were suffering in their breathing?—Yes.

15,706. At what age have you observed that that complaint generally commences?—It takes a decided form between the age of 38 and 45 or 50, and sometimes sooner; it depends upon when they go into the mines. If they go into the mines before they come to the age of puberty, the complaint attacks those miners sooner. There is a number of young boys, at the age of 14 or 15, taken in with their parents into the mines before they are able to work full work.

15,707. And in your opinion, those young persons are sooner affected afterwards than others who begin to work in the mines at a later period?—Decidedly.

15,708. Do the men discover any early symptoms of this disease before they come to you for advice?—They do not apply to me when the cough and the asthmatic symptoms begin; they do not apply for some time—three, or four, or five years.

15,709. So that the early stages of the disease are not always or seldom brought to your notice?—No; the men do not come under medical treatment.

15,710. Do you think that the disease could be checked if it were treated at an earlier stage?—I think so.

15,711. Have you ever known a case of the disease being checked when it was brought under treatment at an early stage?—Yes, several cases.

15,712. Have the men gone back to their work?—Yes.

15,713. And have they had no return of the disease afterwards?—It always does return upon them sooner or later.

15,714. How are the men affected; what are the symptoms?—It begins with cough and difficulty of breathing, and derangement of the digestive organs, mucous expectoration and liquid phlegm, that is the commencement of it.

15,715. When the men come to you for advice, to what do they attribute their complaint?—They attribute it to the mines.

15,716. Do they ascribe it to anything particular in the mines?—To the impure gases which they inhale in the mines, and the powder reek, and the dust and small particle of the rocks and of the different strata they are blasting, which they must inhale more or less.

15,717. Is it your opinion that they are right in attributing it to those three causes?—I believe they are right.

15,718. Have you ever known cases of miners who have left the mines, and who have got quite rid of the disease?—I have known of some leaving between the ages of 30 and 40, before they became decidedly affected, and never being troubled with it at all, and living to a good old age. Many are living over on the west side of the water now who left the mines, and who are now doing very well.

15,719. Have you ever had an opportunity of attending any of the miners on the west side besides those under Mr. Beaumont?—There are no other mines there on the west side. I am sometimes over in Nenthead.

15,720. Do you perceive any difference in the miners in Nenthead or the Alston district as compared with the men who are working here?—I think that the men are not so healthy as the men employed in the West Allen mines; their appearance is not so good; those I have seen in the way of my medical experience, I think that they are decidedly worse than the West Allendale miners.

15,721. What opportunity have you had of comparing the health of the miners in the two districts?—Very little, but I have been called in in consultation with my medical brethren, and all the knowledge that I have has come in that way, not very often either; but their general appearance is more unhealthy than in the West or East Allen side.

15,722. To what do you attribute that difference?—I cannot tell. It may be the imperfect state of the ventilation in the Alston Moor mines. I do not know that they are any worse ventilated than ours, but it looks like it.

15,723. Have you ever made any calculation as to what proportion of the men are affected out of every 100?—I have made no calculation.

15,724. (*Mr. Austin Bruce.*) How many men do you think would leave work at 50 years of age unaffected by the miners' disease?—I should say none at all, or very few at the age of 50.

15,725. At the age of 40, how many men leaving off work do you think would be likely to be entirely free from asthma?—It generally begins between 38 and 45 or 50.

15,726. Then a certain proportion at the age of 40 would be unaffected?—Yes, there is a certain proportion, but I cannot reduce it to figures.

15,727. What would your impression be? would half of the men at 40 be unaffected by the disease?—I think that half would not be unaffected.

15,729. Have you ever examined the expectoration of the miners?—Yes.

15,730. Have you ever observed anything peculiar in it?—Yes, where the disease has become decidedly fixed the expectoration is similar to the expectoration of tubercular consumption, muco purulent, purulent, and sometimes approaching to the expectoration of coal miners' consumption, inclining to a dark blue, nearly black sometimes.

15,731. Have you ever observed that to continue after a man has left off working at the mines?—Yes.

15,732. For a long time?—Yes, they often die with it; those who spit up this dark coloured expectoration very often die with it. Some young men I have observed with this black spit that have got completely rid of it, and they

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are now working in the mines again. In the case of some young men who have gone in too soon to work—

15,733. (*Mr. Austin Bruce.*) To what do you attribute the dark colour of the expectoration?—I should say it is produced in this manner: From the carbon that they breathe from the candle smoke, and the powder smoke, and the strata in which they work.

15,734. I understand you to say that even after they had ceased to work in the mines the expectoration would continue, and the colour would still be dark?—Yes.

15,735. In that case it could not be caused by the substances which they inhale?—Not then, but in past life.

15,736. Do you think that their lungs would be so loaded that the expectoration would be of the same dark colour afterwards?—Yes, I have seen calcareous expectoration for a long while after.

15,737. For how long have you observed that?—I have seen it for a very long time when they have been lying on their death bed; many times I have seen it in the expectoration; but referring to a case that I have in my memory just now, the man did not cease to work for a long time, or rather, he did not live long after he did cease to work.

15,738. In your opinion does this disease affect, to any considerable extent, the length of the miner's life?—Yes, I should say that it does, decidedly.

15,739. Have you formed any opinion as to the extent to which life is affected by it?—I can tell you what I think is about the average duration of miners' lives in my district. I should say that it was about 45 or 46.

15,740. What do you think would be the average duration of the lives of agricultural labourers?—Very near 60, I should say, but I am not prepared to say positively.

15,741. You have stated that, in your opinion, this disease is caused partly by the powder reek that they inhale, and partly by the dust which follows the explosions, and partly also by gases which they inhale?—Yes.

15,742. What are the gases that are thrown out in the lead mines?—I cannot tell, but there is carbonic acid gas very often. I have heard of men being pulled out of the levels almost dead, labouring under the apparent influence of the poison of carbonic acid gas.

15,743. Have you ever known an explosion to take place in the mines?—Yes; in the course of the last 25 years, I have known of carburetted hydrogen being set fire to, but not causing any serious mischief, and there was one young man about 12 or 14 or 15 years ago who exploded in the same kind of rocks some carburetted hydrogen which burned his whiskers and his hair; it singed him a great deal.

15,744. Have you known frequent cases of men who have suffered from inhaling carbonic acid gas?—Not so much lately, the mines are better ventilated.

15,745. Is that, in your opinion, in consequence of a larger supply of fresh air being introduced into the mines?—Yes.

15,746. I suppose that a large supply of fresh air, while it would carry away the powder smoke, would rather increase the danger from the dust?—The miners generally, after they blast a hole, sit down and rest a bit out of the influence of the explosion until it all settles; but there is not a current or draft throughout the mines to cause the dust to fly about, nor to raise it.

15,749. With the exception of the asthmatical tendency, are the miners as a class in all other respects free from disease?—The other diseases to which they are liable from their mining are pulmonary disease, affecting the substance of the lungs, or their investing membrane, the pleura.

15,750. And rheumatism?—Not so much.

15,751. Do you think that the men suffer from being long in the works, and then being exposed to a different temperature when they go home?—I think that that may induce some slight colds or catarrhs.

15.752. You do not distinctly trace rheumatism to that cause?—No; there is some rheumatism, but very little comparatively speaking.

15,753. (*Mr. Holland.*) You have stated that the miners are very liable to pulmonary diseases?—Yes.

15,754. Are the women very liable to it?—Not so much.

15,755. Any more so than other women?—No.

15,756. Are the inhabitants of the districts generally not peculiarly subject to pulmonary disease?—No.

15,757. Not more so than among persons having nothing to do with mines?—No.

15,758. You have also stated that you thought the Alston Moor miners looked worse than the Allendale miners?—Yes.

15,759. Do you mean generally?—Yes, I do; I speak of what I have seen of the Alston and Nenthead miners, judging from their common appearance.

15,760. Do the Alston Moor miners come here to work frequently?—Yes.

15,761. You have stated, that in your opinion, cases of asthma might be cured if treated early; did you mean that the miners might be cured if they left their employment earlier? Yes.

15,762. And they would not be cured by any remedial means if their employment continued?—No.

15,763 As long as the cause continued the effect would continue?—Of course.

Mr. Joseph Cowper Cain.

13,577. (*Chairman.*) You think that the recreation which they have above the surface considerably improves their health?—I think that it has a very beneficial effect upon their health; it improves their health generally.

Mr. John Walton.

16,039. (*Chairman.*) What is the general condition of the men now in this mine, in your opinion?—All of them seem to be very healthy. I do not suppose that we have had one off work from sickness for a considerable length of time in this mine.

16,040. Not arising from working in the mine?—No.

16,041. But from other causes?—From other causes.

16,075. (*Mr. Austin Bruce.*) I suppose that the men here suffer from a difficulty of breathing much in the same degree as they do at the other mines?—Yes, they do.

16,076. Do you think that there are many men who have worked up to the age of 40, underground, who are free from more or less difficulty of breathing?—Great numbers of them in this district are quite free from it.

16,077. What proportion of them should you think are quite free?—I should think more than half of them.

16,078. (*Mr. Holland.*) You mean half of those above 40?—Yes.

16,138. Do young men who begin mining at 20 and upwards, preserve their health better than those who begin very young?—Those who begin to go underground above 20 preserve their health better.

Robert Walton Bainbridge Esq., Teesdale and Alston Moor Mines.

16,235. (*Chairman.*) To your knowledge are there any men working in your mines who have suffered, or are suffering in their breathing?—Yes.

16,236. At how young an age should you say that that first shows itself?—It will depend partly on the constitution of the individual and partly upon the particular places in which he may have been working for some time.

16,237. By places in which he may have been working, do you mean that he may have been working in a place before a communication has been effected?—Yes, or where there has been a large amount of dust.

16,238. Do you think that the dust is injurious to the miner?—My own impression is that it is the dust and the gunpowder smoke, and the absence of day light, that affect the miner's health.

16,239. More than any want of air?—Yes.

16,240. Do you adopt any means when a mine is very dry and dusty to get rid of the dust?—No, I do not know that we can, it arises you see from a moving operation that we really cannot control.

16,241. You mean, I presume, from boring?—Yes.

16,281. (*Mr. Austin Bruce.*) At what age do they generally begin to show that they are affected by their lives as miners?—Perhaps about 40.

16,282. Is their health then usually so affected in your opinion, as to diminish the produce of their labour?—No, I do not think that it is. By that time, generally speaking, the younger members of the same family connexion will work with the older, and there is the skill of the one and the physical energy of the other, the one compensates for the other, and there is a good deal of that among the miners. Supposing the members of the family of an old man see that he is rather failing, they will work along with him, and take the laborious part of the work off him.

16,296. Do you observe any difference between the relative health of the miners in the different districts under your charge?—I should say, that upon the whole Westmorland is our healthiest district.

16,297. Where in Westmoreland are your mines?—At Dufton and Hilton and Merton.

16,298. Do you attribute the slightly superior health of the workmen there to any particular cause?—One cause may be this: the men are living in a farming country, and can get an abundant supply of milk and oatmeal, and everything of that kind. Another cause may be this: that when they are not working underground, they may be able to obtain agricultural employment, which is beneficial to them

16,299. Do the do so occasionally?—Yes, most of our miners, when they have completed the 40 hours which we require of them, will obtain any above-ground employment that they have the opportunity of getting.

16,300. You stated that in your opinion dust was the chief cause of the miners' disease?—And the gunpowder smoke. I should say also, that if there was bad ventilation there would be a great injury, but then we endeavour that there shall be no bad ventilation.

16,323. (*Mr. Davey.*) Do you find any difference in the men who hold these small farms, and those who live in the Company's houses?—Not in a point of general health; because the fact is this, those men who live in our houses are found by us with gardens.

16,324. Does it improve their condition as miners?—I conceive that it does. The holding of a small farm will improve the family condition of a miner; it is calculated to improve both his health and his circumstances. But in order to compensate such of our men as have not farms, we endeavour to provide them with gardens.

Mr. William Ewart.

16,360. (*Chairman.*) Do you observe as regards the health of the miners that there is any peculiar disease to which they are subject?—Decidedly; there is one variety of disease; that is, disease of the lungs, commonly called bronchitis: the disease called bronchitis is not peculiar to miners, but there is a variety of bronchitis both acute and chronic, peculiarly belonging to lead miners.

16,361. (*Mr. Holland.*) You mean to say that miners are liable to a peculiar form of bronchitis?—Precisely so. I am not acquainted with other mines. This disease is not produced by the lead.

16,362. (*Chairman.*) By what is it produced, in your opinion?—In my opinion this bronchitis is caused by a variety of influences; these as far as I am able to judge, are, the air being rendered impure by physical particles from the stratifications, these being limestone, sandstone, and so on, the irritating gases produced by the explosion of the gunpowder, which is so extensively used in blasting these stratifications, by the men's own respiration polluting the air with carbonic acid, and by the combustion of candles.

16,366. At what age have you ever observed that miners are attacked with the first symptoms of this disease?—They are attacked at all ages. The first thing generally by which a miner is attacked is acute bronchitis, which is simply inflammation of the lining membrane of the air passages more or less.

16,367. At what age have you observed it?—From the age of his entering the mine at 20 or 21, during the whole time, they are almost all liable to these attacks; almost the whole of them have an attack either light or severe, I should say, before 35. I give a good margin there. I had a case the other day of a man about 25 or 26. These attacks are generally easily subdued, they are acute, and the men go to work again. They commence under the same circumstances.

16,368. (*Mr. Holland.*) Do you mean that the attacks are acute and short?—Is is according to the severity; they are sometimes not long, perhaps I may say, that generally the men have come under treatment for a fortnight or three weeks.

16,369. (*Chairman.*) When that happens to men so young, they can go back to work?—Yes, they get quite well again.

16,370. They are not affected at all in their breathing?—They are generally slightly asthmatic. I use the word asthma simply as having the meaning of shortness of breathing. Almost all our miners, be they young or be they old, from the first attack of bronchitis, from their having wrought in the mines a year or two, are slightly broken-winded,—slightly affected in their breathing. A man supposing himself to be thoroughly healthy, when I an walking with him, beginning to ascend a bank, begins to show difficulty of breathing; he breathes fast and quick

16,371. When they have come under your care, have you ever thought it right to recommend that they should not go below again?—Yes, I sometimes do that, but it is a difficult thing to enable them to remain outside.; there is no work for such a number of men; but in some cases I decidedly recommend that they should not go underground again if possible.

16,372. Do you think that the effect of their going underground is likely to confirm the disease?—Assuredly, where the disease is in a chronic condition. What I mean by "chronic," is certain effects which we suppose to be perhaps a little thickening of the lining of the air tubes, partially closing the passage; there is a little of that left, which produces the asthmatic breathing. A man continues to work in that condition for years perhaps, but then again he is seized with an acute attack, which injures his health, and renders this chronic condition of disease still more decided and still more extensive, and still more severe.

16,373. Could you name men who are affected in their breathing, and are still working in the mines?—Decidedly so; I could find out several; I have no doubt of it

16,375. Do you ever go down into the mine yourself?—No, I have been in a mine; I have gone into a mine just to see the mine.

16,376. Have the men ever stated to you that they have been affected by working in any particular level?—I am sure that they have; I am sure that men have stated to me that they have been injured by working in such a forehead, but I cannot call to mind the particular place.

16,377. What is the man's opinion of the cause of his disease generally?—I should think that generally speaking the men's opinion is very much what I have stated, that it is owing to impure air, not, perhaps, that they are capable of stating the scientific causes of that impurity; but, as far as I know, I believe that their opinion is generally that their complaints are caused by impurity of air.

16,378. (*Mr Kendall.*) Having given a great deal of attention to this matter, has it ever struck you that there is any mode of working which might remedy the defects there?—As far as I have been able to judge, the modes of prevention resolve themselves into the proper ventilation of the mines, and of course into a proper attention on the part of the miner to his general health; and there is one thing that the miners do which I have sometimes thought they ought not to do, they work in flannel shirts which have sleeves, and of course one half of the miners are always employed in striking a borer; these sleeves are continually full of dust, and they must breathe an air much fuller of dust than if they were robed without this flannel shirt altogether. The another thing is this: the atmosphere of a mine is generally much warmer than the external air, they prespire, this flannel shirt gets saturated with moisture, they come into the cold air and frequently there is a chill, at all events a chill is likely to be produced in that way. Now, I would suggest that the miner should if possible, work bare to the waist, and that he should have his flannel shirt kept thoroughly dey and comfortable, which he could put on when he came towards the external air.

16,379. You have no reason to suppose that there is any lack of ventilation?—No; as far as I know, I believe that eveey attention is paid to the ventilation of the mines.

16,380. (*Mr. Holland.*) Did you not just now recommend improved ventilation?—Yes, improved in this way, if possible; supposing that a level is being driven into a hill where there is no shaft, and no possibility of a current of air passing into the level and out at another outlet. I dare say it must be, to engineers, very difficult indeed to produce a proper change of air, at what is called the forehead; I suppose that they have various contrivances to carry up pure air by means of machinery. My department being so thoroughly outside, I am not called to go down the mines.

16,381. You spoke of miners being very liable to acute bronchitis at all ages; is that in young miners produced by catching cold or by dust?—I look upon the dust in the young miner as the predisposing cause, and generally speaking the exciting cause of the attack is exposure to cold.

16,382. By catching cold?—Yes.

16,383. They generally recover from those early attacks of acute bronchitis pretty well?—Yes, time after time, generally speaking.

16,384. After a time the attack becomes less acute?—Yes, it seems that there is a progress.

16,385. Is there thickening of the mucous membrane?—Yes; that is an inference, because without a post mortem examination I would not speak positively; but from the expectoration and from the physical signs, from the sounds listened to by the stethoscope there is a pretty fair and sure inference that there is a thickening of the lining membrane of the air tubes.

16,386. What sounds do you hear by the stethoscope?—Sibilant,—mucous, sonorous, and hissing.

16,387. A whistling sound?—Yes.

16,388. Is that whistling sound frequent?—Not very frequent; the most common sound that I have listened to is a sound something like a snoring sound.

16,389. I think you have said that almost all miners are slightly broken-winded after their first attack of acute bronchitis?—Yes, more or less, but it is sometimes so very slight as scarcely to be noticed.

16,390. But still it is noticed?—Yes, they all confess that they are affected more or less with shortness of breathing.

16,391. You have stated that they spit up discoloured sputa a long time after leaving the mine?—Yes.

16,392. Do you believe that that discoloured sputum has been in their lungs all that time?—I can account for it in no other way but by believing that it has been, because it is of the same colour, and the same sort of matter as they spit generally on leaving a mine. A miner almost always on coming out of a mine, from a little irritation of the throat, heaves up a few mouthsful of this coloured expectoration.

16,393. What colour is it generally?—A sort of greyish blue.

16,394. Where do you suppose that that matter has been lodging all that time?—I think that it must have been lodging in the lining of the air passages, and probably in the air cells.

16,395. What quantity would there be to last for 20 years?—I cannot say.

16,396. A pound or two?—No, I should think not so much as that, it is exceedingly light.

16,397. I understood you to say that they continued to spit this discoloured matter?—While working in the mine they are always spitting a little of this discoloured matter; but I am speaking of a man who has not been in a mine for ten years; he is then seized with an acute attack of bronchitis, which gradually verges into a chronic condition, and he goes on spitting this discoloured matter until death.

16,398. With pus?—Yes; it is sometimes decidedly purulent, of the nature of pus and coloured again, and he continues to spit this coloured stuff during the last attack until death.

16,399. Does he go on spitting it day by day for years? He may do so for several years, more or less. I have had a case of this sort; a man, judging from my recollection, perhaps about 50 years of age, who had not worked in a mine for eight or ten years, he is seized with acute bronchitis, he begins to spit and he spits a considerable quantity of this blueish matter. By treatment, he is relieved of this attack, and he again ceases to spit for a time, longer or shorter, according to circumstances; he is seized again, perhaps, a year after this. These attacks very often come on in spring. In the commencement of the winter, he is again seized with an acute attack, and he spits the same matter for a short time again; he is relieved again, but he is not a healthy man; he is laid off again, he goes wandering about, and perhaps doing a little light work about a little farm which he may have, and at last he is seized again with acute bronchitis, and this proves intractable and severe, and it just gradually verges into a chronic state with irritative constitutional fever.

16,400. (*Mr. Austin Bruce.*) In the case which you have mentioned, where you have supposed that a man has left work for eight or nine years when the attack has come on, what has he been doing during those eight or nine years; has he been, in your view of the case, expectorating all the time?—Yes, more or less.

16,401. And expectorating matter discoloured by the substances which he has inhaled during the time that he has been working?—Yes, more or less.

16,402. Do you think that he could during that time have laid in a stock of discoloured matter sufficient to supply the expectorations of many years?—When I speak of his expectorating during the intervals of these acute attacks, I mean to say, that perhaps a single sputum in the day may be slightly coloured, he does not spit that coloured stuff when he is walking about in the intervals between the acute attacks, so that my belief is decidedly that this blue expectoration is the result of the inhalations in the mines.

16,403. (*Mr. Holland.*) But I understood you to say that that supposed mechanical irritant was only after long intervals, and for a few days at a time, in any quantity?—Yes.

16,404. And at other times it was exceedingly small?—Yes, during the intervals of the acute attacks.

16,405. (*Mr. Austin Bruce.*) At what age do men usually discontinue working from inability to bear the fatigue of work?—It is not in my power to state an average, but some are obliged to give up work before 40; some work till 45, and some till 50.

16,406. Do many attain the age at which they become entitled to pensions, namely 65?—I am afraid not, but I cannot speak with certainty; it must be a small proportion, I should say.

16,407. What is the general moral character of the lead miners?—I should say pretty good; for instance, with regard to intemperance, in intoxicating drinks, they are pretty free from that as far as I am able to judge.

16,412. (*Mr. Austin Bruce.*) Does the miners' disease in any way affect the constitutions of their children?—Not that I am aware of.

16,413. Are the children generally healthy and robust?—Yes, until they begin mining operations.

16,414. (*Mr. Holland.*) Is there any excess of scrofulous disease among them?—There is a good deal of scrofula.

16,415. Is there any excess?—No. We must take into account our climate, and we must take into account our locality.

16,416. But compare it with a similar climate?—Compared with a similar climate there is no excess of scrofula here, but we have a good deal of consumption of the lungs in those who are not working in mines.

16,417. Do you attend the women as well as the miners?—Yes.

16,418. Do they suffer from phthisis?—Yes, a good deal.

16,419. Have you noticed true phthisis most amongst the men or the women of the miners?—It is quite as common amongst the women as amongst the men.

16,420. Is it not more common?—It is, perhaps, a little more common. I have not noticed it particularly, but from general recollection I can call to mind case upon case which I have had, and I can state that it is my opinion that phthisis prevails (I mean real phthisis from tubercles) more amongst the women than amongst the men.

16,421. Do you consider that the miners are healthily lodged in their dwellings?—Yes, generally speaking.

16,422. As well as agricultural labourers?—Better.

16,423. And better fed, or the same, or how is it?—With regard to the food it very much depends upon themselves.

16,424. What is the fact?—I should say that they are fed quite equally; what I was alluding to was a circumstance more applicable to the woman of the house than to the man; they are too much inclined to live upon unleavened bread; that is to say, cakes made on what they call the girdle,—heavy indigestible bread.

16,425. Is that the practice of the miners or the practice of the country?—It is the practice of the country, but very much the practice of the miners.

16,426. Is it more particularly the practice of the miners than of the agricultural labourers?—No. We have very few agricultural labourers here. The country is almost entirely mining; but I should say that it is the general practice of the country to use that bread.

16,427. Is dyspepsia prevalent among the miners?—Yes.

16,428. Unusually so?—No, not unusually. This chronic bronchitis, of which I am speaking, will unhinge the system.

16,429. Does dyspepsia precede bronchitis or bronchitis precede dyspepsia?—The bronchitis precedes dyspepsia, beginning when a man is young; and he very often has dyspepsia when his health has been a little shattered by repeated attacks.

16,430. Do you attribute that dyspepsia to the shattered state of the men's health from bronchitis, or to some other cause?—I do not mean to say that dyspepsia is a common accompaniment, but I meet with it now and then as an accompaniment of this chronic irritating disease of the lungs.

16,431. As an accompaniment, or as a consequence?—I would not say a consequence; I am scarcely in a position to say that.

16,432. Have you ever heard them complain of loss of appetite, or bad appetite from mine air?—No.

16,433. Do you think that they eat with as good an appetite as other workmen, or are their appetites delicate and capricious?—I should think that the appetite is rather delicate.

16,434. Are they fond of rich and stimulating and more tasty food than other workmen?—No, they generally live on very simple food.

16,435. Insipid food?—Yes.

16,436. They have not any craving for tasty, high-seasoned food?—No, decidedly not.

16,437. Do they ever complain of great heat in the mines, or closeness of the air. Do they attribute any of their disease to closeness or heat of air in the mines?—I have not heard any one attribute disease to that.

16,438. Or do they complain of discomfort in the mines?—No, certainly not.

16,439. You would be sure to hear of that if it were the case?—Yes, decidedly so. I have now and then heard a man say that in his life he has worked in a bad place, in a close fore-head. That may be one case out of 400 men.

16,440. That is a very rare thing?—Yes, I feel certain of that. I can speak with confidence on the point, that I do not hear it made a subject of complaint.

16,441. Do they complain of the candle smoke as a source of annoyance?—No, I have not heard the smoke of candles complained of.

16,442. Have you never heard them attribute any of their disease to that?—No, decidedly not.

16,443. Do they complain much of the powder smoke, the reek?—They do not complain of it much; they do not complain of it to me, at all events.

16,444. You think that it is mostly the dust of the rock?—Yes, decidedly.

16,445. Would that give a clay-coloured yellow spit?—No, it depends upon the stratification; because the blasting of the rock with the lead ore is of a blueish colour; but my impression is that the dark colour is produced by the smoke of the exploded powder.

16,446. It is black?—Yes, blackish; carbonaceous, as if it contained a little carbon.

16,447. Is it a rare thing for men to get above 40 without being touched in their lungs permanently?—Very rare indeed; I cannot call to mind having met with a miner who is not more or less affected with shortness of breath before he is 40 years of age.

16,448. Permanent shortness of breathing?—Yes.

16,449. At what age do you consider a miner an old man?—I should consider a miner really an old man at between 55 and 60

16,450. A decidedly older man than an ordinary workman?—Yes, than an agricultural labourer, for instance, decidedly.

16,451. Or a joiner?—Or a joiner, or a mechanic of any sort.

16,452. Very distinctly so?—Distinctly so.

16,453. (*Mr. St. Aubyn.*) Is the Commission distinctly to understand that you have known several cases of men who have lived eight years after leaving their work, and who at intervals during that time have been subject to a discoloured expectoration?—Clearly so. I understand the question thoroughly, and I answer distinctly.

16,454 (*Mr. Holland.*) Do you not think that it is probable that this discoloured sputum may be a secretion of the lungs, and not an excretion of that which has been received into the lungs?—I should say that it is possible, simply stating an opinion of my own. I say that is is decidedly possible that this dark matter, whatever it may be, may be secreted by the lungs.

16,455. Do not you think that it is probable that the slight discolouration which you speak of as continuous is a secretion, whereas the large quantities which come very occasionally may be an accumulation in the air cell or otherwise?—I will state the hypothesis which I have. I reason in this way: a miner during his work in the mines is continually breathing an air loaded with matter of this colour; daily as he goes from the mines he spits up a little of this coloured mucus, and after leaving the mines he has an acute attack; this acute attack spreads more or less over the lining membrane of the air tubes, and perhaps sometimes even extends into the cells; that after a short duration brings on an excited action and an increased secretion; and my hypothesis is, that during that state of activity of secretion it loosens, as it were, and carries off this accumulated impalpable powder. We never find the whole lung affected with this acute attack of bronchitis, it is only portions of it, portions of the tube and portions of the air cell; but subsequent attacks affect other portions of the lung and bring away other portions of this coloured matter, and attack after attack, as far as I am able to judge, affects a large portion of the lung, ultimately, perhaps, affecting nearly the whole substance and producing increased secretion from a large extent of mucous membrane; it dislodges a quantity of this coloured stuff, and at last is so severe as to kill the man, and though I have had no post mortem examination, still my impression is that if there was a post mortem examination there would still be a portion of this coloured matter found in the cells or small tubes of the lung; that is the hypothesis which I hold.

16,456. (*Mr. Austin Bruce.*) My difficulty in following your statement is this: I can understand that a man who had been for many years inhaling this dust might be giving out a certain portion of it for the rest of his life, but I cannot understand how the portion which he gives out from time to time should be sufficiently large to discolour the copious expectoration which you have described?—When we say "copious," it depends upon the quantity; and there is another consideration, this colouring matter is not deep, the spittings are generally simply streaked; there is with them a thin streak of blue through the middle of the sputum, and the colour shades off. There is evidently in this expectoration not a great quantity of colouring matter in weight.

16,457. (*Mr. Holland.*) Are the men apt to breathe any smoke elsewhere?—No.

16,458. Are you aware that the inhabitants of smoky towns constantly spit up black sputum when quite well; mucus tinged with soot?—Yes, I believe so, and I know that the colliers are accustomed to spit up immense quantities of black expectoration.

16,459. The black matter of the sputum is very small in quantity. A very small quantity of this colouring matter will tinge the expectoration. In these men of asthmatic breathing, in the progress of its passage from the lung it is positively churned and mixed up with the bubbling of the air.

A MINER.

16,994. (*Mr. Kendall.*) Why are you not a working miner now?—I have been out of health about 22 weeks.

16,995. (*Chairman.*) How are you affected so as to be off work?—It is in my chest.

16,996. Have you been to the doctor?—Yes.

16,997. What does he say that it is?—He say it is a weakness in my chest. I started with an inflammation in my chest, but it has left a weakness in my chest.

16,998. Did you ever suffer in your breathing before?—Yes; I was affected in my breathing, but not in a great measure.

16,999. At what age were you first affected?—About four or five years ago.

17,000. But you were not laid off work then?—No

17,001. You were not laid off work till the inflammation in your chest?—No.

17,002. Did the doctor say how it arose?—I think that it arose by cold.

17,003. Did he say that it was in consequence of your having been affected in your breathing before?—No, he did not say anything of the sort.

MR. ADAM BARKER, Whitarsida and Summer Lodge Mine.

17,037. (*Chairman.*) Did you ever know man suffer from working?—I suffered a great deal from it. When I was about 40 years of age I began to want wind very much.

17,038. Have you got quite over that now?—No; I shall never get over it.

17,039. Do you attribute it entirely to working in that one place?—I attribute it to nothing else but that very place.

17,065. Do you attribute much of the illness which you suffered then to the dust or to the close air?—The illness is the want of more breath; I found it out when I was 40 years of age. I cannot say that I felt anything. I was then about 24 years of age, just in what you may call the primo of life, and what I used to think was about as beneficial as anything for me was a piece of fat beef, fat mutton, or bacon.

17,066. I understood you to say that you got an illness

30 years ago from which you have not recovered yet?—Certainly I did; I only wanted more breadth.

17,067. What do you think was the cause of that illness?—Nothing but the dust from this very vein.

17,068. The dust or the bad air?—Both combined. I had bad air and I had this dust to contend with.

17,069. Is much more attention paid to ventilation now than there was 30 years ago?—A very great deal.

17,070. Are the men more healthy than they were when you were a boy?—I believe that they are healthier in general. In fact a mine is nothing now to what it was when I was a boy.

17,071. Your fellow workmen now are more healthy than they were 30 years ago?—Yes.

17,072. Are you sure of that?—Yes; I am certain of it.

17,073. (*Mr. Leveson Gower.*) At what age did you begin working?—14.

Mr. John Richard McCollah.

17,112. (*Chairman.*) Have you an opportunity of examining many cases where the men are what is termed broken-winded?—I have attended very great numbers of them.

17,113. Have you ever had a post-mortem examination?—Not in cases of that kind.

17,114. Do the miners come to you in the earlier stages of the affection?—They very frequently do.

17,115. Do you know cases where you have been able to effect a cure in the earlier stages?—Yes; it generally begins as chronic bronchitis.

17,116. But the men continue to work at the mines, and still may get over it?—I generally caution them against working in mines which are ill-ventilated; the lead miners call it working in a windless groove; I caution them against that when I see that there is any affection of the breathing.

17,117. On a miner coming to you do you inquire as to the place in which he is working?—Yes, that is generally the first question I ask.

17,118. Do you ever yourself go underground?—No.

17,119. Can you point out many cases now where men are affected and still are working on in mines?—Yes.

17,129. (*Mr. Holland.*) You have said that you have practised 28 years?—I have.

17,130. Have you noticed any improvement in the health of the miners in that time?—Yes.

17,131. Is it marked?—Yes. In some parts of the district in which I have practised, scrofulous disease used to prevail to a very serious extent.

17,132. Was that among the children?—Children and grown-up people too; and I can see a marked improvement in the constitutions of the people in that locality since I commenced practice.

17,133. To what do you attribute that change?—I should say to a better mode of living; better diet.

17,134. Have their habitations been much improved?—Yes, their habitations have been a good deal improved too.

17,135. Have you noticed any marked change in their habits of cleanliness?—No, I cannot say that I have; the people in this part of the country are generally a very cleanly people.

17,136. And they were 28 years ago as cleanly, were they?—Yes.

17,137. Is there sleeping accommodation much better than it was?—It is.

17,138. Very decidedly better?—I think it is very much improved.

17,139. You feel satisfied that there is a diminution in scrofulous disease, do you?—Yes.

17,140. Is there decidedly less of the peculiar miners' disease now than there was 20 or 30 years ago?—I think that there is a diminution of it.

17,141. But you are satisfied that there is a peculiar disease among the miners?—Yes.

17,142. A well recognised form of lung disease?—Yes; this I believe is entailed upon them by working in the mines entirely.

17,143. And which you do not see among any other people but miners?—No. Of course where there is a tendency to tuberculous disease, where there is a tuberculous constitution, in those kind of cases it generally ends in consumption; but in the common run of cases it ends in miners' asthma.

17,144. At what age does miners' asthma generally show itself?—At different ages; I have seen men from 26 to 30 years of age badly affected with that disease; but sometimes it will not show itself as a permanent affection till a man is between 50 and 60.

17,145. Does it frequently first show itself after 30?—Yes, it does.

17,146. Does it come on very slowly?—Sometimes it does and sometimes it does not; sometimes it comes on in a very chronic form, with a little cough and expectoration, and the man perseveres in going to work; if he happens to be working in a place which is not particularly well ventilated, the affection continues until he is obliged to discontinue work.

14,147. It may go on for many years before it lays him up?—Yes, it may.

17,148. Does it frequently begin like a cold?—It does.

17,149. From which the man recovers?—Yes; it begins just as a case of common bronchitis.

17,150. Do you agree with the evidence which has been given to the Commission, that it is to a great extent produced by a succession of colds; have you observed that. Some medical men think they have observed that it has been produced by a succession of colds, to which they think that miners are liable, more liable than other men; does that correspond with your observation?—Yes.

17,151. Have you noticed whether men who work in the grit rock suffer more or not from the dust than those who work in the limestone rock?—I believe they do; they generally complain of suffering more in working what the miners call the plate.

17,152. I suppose that the true miners' asthma is quite a distinct disease from consumption, is it not?—Entirely so.

17,153. Does it very closely resemble ordinary chronic bronchitis?—It resembles ordinary asthma.

17,154. (*Mr. Leveson Gower.*) What is the earliest age at which you have seen this miners' asthma?—I cannot positively say as to that.

17,155. Are boys affected by it?—No; they frequently die from bronchitis.

17,156 Which is caused by working in the mines?—Which is caused by working in badly ventilated parts of the mines.

17,157. It never gets to miners' asthma at that early age?—No.

17,158. But you believe that the seeds of the disease are formed?—There is no doubt of it.

17,159 (*Mr. Holland.*) The early cases would probably be acute catarrh?—No; it comes on with coughing and expectoration.

17,160. (*Sir. Philip Egerton.*) Is it an inflammatory disease?—Yes.

17,161. Are the membranes affected?—Yes.

17,162. Does it sometimes become tuberculosis?—If there is a comsumptive tendency it is very apt to bring on consumption.

17,179. (*Mr. Kendall.*) Do you think that miners' asthma now is as prevalent as it was when you first commenced practice 28 years ago?—I do not think it is.

17,180. Is there a very sensible diminution in it?—There is.

17,181. That you attribute to better ventilation I suppose?—I do.

17,184. But still your impression is that the disease is different from tubercular disease?—Yes, decidedly.

17,185. With regard to dust; you have never seen the men working underground?—I was never but once in a lead mine.

17,186. You have never seen the dust?—No.

17,187. And you have never seen any expectoration?—I have, frequently.

17,188. There is no mark in it all?—No.

17,189. Have you ever heard them complain that they suffered more when working in the plate than in lime or elsewhere?—I have heard them say that they suffer most from working amongst the plate, black plate as they describe it.

17,190. Taking it as a whole, do they say that they suffer more from the air or more from the dust?—They suffer more from the air, from the want of air, as I understand them.

17,191. Is the air in plate worse, or have you ever heard that there is any carbonic acid which comes from plate?—No. I think that there must be carbonic acid, because they say that it is a kind of black damp which they especially believe injures them.

17,192. You fancy from the feeling which the men describe that it is not at all unlikely that carbonic acid gas may arise when they come to plate?—I should think that it is very likely.

(A^{a}.) Health and Diseases of Miners.

17,193. (*Chairman.*) When you say that you have observed the men when they have come to you spitting up black sputa, does that continue for months together after they have ceased working? It is dark-coloured sputa.

17,194. Have you ever examined that sputa with a microscope?—I have not

17,195 You say that you advise men when they come to you in the first instance to leave the part in which they are working, have you found that they have done so generally?—Very frequently.

17,196. But I suppose that sometimes they cannot afford to do so?—No, sometimes if they happen to be earning tolerably well, they have a great objection to leave the place, and they continue until their health will no longer admit of it.

17,197. Do they earn more money when they are working in bad places?—I am not aware that they do, generally speaking. If they are taking a good quantity of ore, and making what they call pretty good wages, of course they have a great objection to leave it.

17,207 (*Mr. Holland.*) Are you satisfied that there is more scrofula here now than in most districts?—I was never in a district in England where there was so much scrofula as there is here, but it is almost entirely confined to one particular locality. At Hurst they are almost exempt from scrofulous disease. Intermarriage it is said has a great effect in producing scrofulous disease. I should say that Hurst must be an exception to that rule, because its inhabitants are nearly all relations; they have intermarried generation after generation. and still you can hardly go among a finer body of men or woman than they are, and they are, generally speaking, very healthy.

17,208. And there is no excess of scrofula among the children?—No.

17,209. To what do you attribute the excess of scrofula in the district where you say it is peculiar?—I hardly know what to attribute it to, it may be partly from limestone water. I believe that formerly in that locality they brought up their children almost entirely on oatmeal; that might have some tendency to lay the foundation of the disease.

17,210. Is that a damper place than the rest?—No.

17,211. Is the bed-room accommodation worse?—No.

Mr. Ralph Milner, Whiterside, Summer Lodge Mines, &c.

17,221. (*Chairman.*) Do you know of men suffering at all from working in mines?—Yes; I have seen men suffer. Different veins have different effects upon men.

17,222. What is the effect?—The hard veins they have to hew out with picks and different things and wedges; the stour comes from it wherever it is; let it be ventilated, it still affects the miners a great deal.

17,223. (*Mr. Holland.*) What do you mean by "stour"?—Dust

17,224. (*Chairman.*) In what description of strata is that, in the lime, or the grit, or the plate?—In all.

17,225. Which do you think is the worst?—I think that plate is the worst.

17,226. Have you been down a mine when the men have been working in the plate?—Frequently.

17,227. Is it a small dust?—It is a small dust.

17,228. Is there any carbonic acid, do you suppose, in the plate, or anything in the plate besides this dust which is injurious?—There is sometimes sulphur in the plate.

17,229. How do you ascertain that?—There is what we term "catheads."

17,230. (*Mr. Holland.*) Is that pyrites?—Yes; it is sometimes sulphur.

17,231. Does it give off a smell?—Yes.

17,232. (*Chairman.*) Ventilation will not get rid of the stour?—It will improve it a great deal, but will not finally do away with it.

17,233. Do the men ever use water in working?—Yes; I have seen water used for boring holes.

17,234. But not by way of getting rid of the stour?—No; I never saw any case of that.

17,235. Have you ever known the men obliged to leave the place from the dust when working in plate?—No; I have seen them working hard, but not give it up; wind has generally got to them by some means, what we call a "windy king."

17,236. Does that completely remove it?—No.

17,237. So that they must inhale a certain portion?—Yes.

17,238. Have you heard the men complain long afterwards of it?—I have heard them complain of spitting out a black stuff.

Mr. Thomas Coates, Arkendale and Fell End Mines.

17,285 (*Chairman.*) You say that you have often worked in close fore-heads?—Yes.

17,286. Did you ever suffer from it?—No never; I have worked as a worker, and have worked hard as an agent ever since I was an agent. You caught me yesterday, and I go on so every day.

17,287. What age are you?—53.

17,288. Have you ever known men suffer from working?—Yes, I have known some men that I have worked with 30 years since, who died when they were not above 40, and they were working in the same place with me; very likely they were born rather asthmatical.

17,289. Do you think that, if a man was perfectly healthy he would not be affected by working in bad air?—If he worked a long time in bad air I have no doubt that it would affect him and affect his wind; but as the mines are now, generally speaking, I do not think that he would take any harm.

17,290. You think that working by levels has given a better ventilation?—Yes; and they have taken a good deal of hard labour off.

17,291. Is there any place about here that we could see where a candle will not burn?—I do not know of one, if I did, I of course would have taken the Inspectors to it; I was never afraid of the Inspectors coming.

Sir George William Denys, Bart.

17,363. (*Chairman.*) Do you know of any men being affected by working?—I think that all the miners are more or less affected by it after a certain number of years.

17,364. Do you think that that is from the air or from the dust?—Partly by the confinement, and the quantity of gunpowder which they are obliged to use; it affects the lungs.

17,401. (*Mr. Holland.*) Are miners much off work from illness?—When once they begin to fail, they generally give up altogether.

Mr. Robert Daykin, Hurst Mine.

17,443. (*Chairman.*) Have you known of men broken-winded from working in the mines?—Yes, we have some; but I am afraid that a great deal of this arises partly from constitution and habits; some men are not very cleanly, and it sometimes happens in that way; I have found fault with many miners on that account, not in our mines particularly, but in other places as well.

17,500. (*Mr. Holland.*) Do your men live near to the mine, or some distance off?—Near to the mine. I think that it is an evil to have the cottages so near, a man is always better for having to walk a certain distance; I have remarked it, a man thrives better and gets his lungs more cleared by walking a short distance from work previous to eating. I think that he ought to walk two or three miles.

Mr. John Knowles.

17,721. (*Chairman.*) Are the men much affected in their breathing?—Yes, they are, when they get to a certain age.

17,722. From what do you think that that arises?—From working in the mines there is the black, and there is the dust as well. At the same time we have men now who are working in the mines upwards of 70 years of age.

17,723. Some men are affected when young, and others are not affected by it?—Yes.

17,724. Does that at all, do you think, depend upon the mines in which they have been working?—Yes, if it has been a hard forehead they are more affected.

Mr. Reuben Atkinson, Arkindale Mine.

17,770. (*Mr. Holland.*) Did your complaint at first come on very slowly?—I have no complaint on me except when I am fatigued

17,771. When did you first perceive that you were that way?—A few years since, it may be ten or a dozen years since. When I was climbing up a hill, or a rise or anything of that sort, I was rather put out of breath, that was all

17,772. I suppose you hardly knew when it began?—No.

17,773. Is it a feeling of tightness?—No, I do not feel any complaint at all.

17,774. You have no pain from it?—No.

17,775. No spitting?—No.

Mr. Thomas Edmundson.

17,866. (*Chairman.*) Have you any men now that you are attending who are suffering from this disease?—Not at present, I think.

17,867. Have you ever traced a man's illness to a particular level or a particular fore-head where he has been working?—I have known that he was working where there was not sufficient air, where the air was bad, and that it affected his lungs, and that he spat a black secretion from that. When the club was going on, the men when they ailed anything came direct because they had nothing to pay extra, and of course when they had medical assistance early it did not go for that length of time.

17,868. Then it is of importance that they should apply to the medical man at as early a date as possible when they feel affected?—As soon as they feel it.

17,869. What are the first symptoms?—Difficulty of breathing, and the features of the face when they come out are purple and rather swelled; but after they have been out for two or three hours and have got a quantity of fresh air that goes off.

17,870. Is the stomach affected?—The liver and stomach: the liver is generally gorged. When the lungs do not do their duty, and do not get fresh air, it throws a quantity of work on the liver and other parts; indeed if the lungs cannot admit the air the liver becomes gorged with bile

17,871. (*Mr. Holland.*) What direct evidence have you that the liver becomes gorged?—It is enlarged.

17,872. Can you feel it enlarged?—Yes; and you can feel it tender, and you can see that the motions have not the proper quantity of bile in them.

17,873. Is that an early symptom in this complaint?—It is; the first and prominent symptom is difficulty in breathing, then flatulence of the stomach and disorder of the liver.

17,874. Is the complaint which you speak of as miners' asthma common among the miners?—It is frequently seen.

17,882. What disturbance of the digestive organs have the miners?—Great flatulence of the stomach and torpid secretion of the liver

17,883. Is it general dyspepsia?—General dyspepsia.

17,884. As an early symptom?—Yes

17,885. That is before the lungs are affected?—That is before the lungs are violently affected.

17,886. Do you attribute that disturbance of the digestive organs to a previous diminution of the respiratory function?—I fancy that it throws additional work upon the liver, and that the blood which goes through the liver, which ought to have the effect of oxygen in the lungs, does not get it I should think that the liver prepares the blood (that is Liebig's idea) for going through the lungs.

17,887. You agree in the general opinion that the deficiency of the respiratory function is a cause of indigestion?—Yes.

17,887a. You spoke of there being an absence of respiratory murmur in the lungs in the miners' complaint; is that an early symptom?—No, that is when the asthma has set in some time.

17,888. In what part of the lungs is the respiratory murmur most absent?—The higher part.

17,889 Do you find that the higher part of the lung is more affected than the lower?—In some cases it is one and sometimes the other, and sometimes both.

17,890 In which is it most frequent?—The left lung.

17,891 And the higher lobe?—Yes.

17,892. You are well satisfied of that, are you?—Yes.

17,893. Your supposition is that the air cells are clogged?—Yes, with deposit.

17,894. Have you ever had a post mortem examination?—No

17,895. You are well satisfied that the air cells get clogged with carbonaceous matter?—I go from the air not circulating in them, from the difficulty of breathing, and from the sound.

17,896. As I understand you, instead of being separate in the form of carbonic acid it is separate in the form of solid carbon?—Yes

17,897 That is your hypothesis?—That is my idea.

17,898 That the defective respiration prevents the separation of carbon in the form of carbonic acid, and that it is secreted in the form of solid carbon?—Yes.

17,899 And that hence arises the black spit?—Yes, and that the carbon is not neutralised by the oxygen in the lungs

17,900 Is this complaint, the miners' consumption, peculiar to miners; do you ever see it among others who do not go down mines?—I do not. I have seen cases where there was difficulty of breathing where there has been congestion of the lungs.

17,901. Is the disease among miners a peculiar disease, or is it only an aggravation of what is common among other people?—It is an aggravation of what is common among other people where they breathe bad air.

17,902. Do you think that it is produced only by breathing bad air?—No, not that particular effect; you have not the black spit.

17,903. What disease which affects ordinary people does miners' consumption most closely resemble?—Congestion of the lungs.

17,904. Not bronchitis or any inflammatory affection of the lungs?—No, it is congestion of the lungs.

17,905. Have you noticed any cases in which there has been a marked thickening of the bronchial membrane?—No.

17,906. For instance, where there have been rough sounds of the air passing through the bronchial tube?—Yes.

17,907. Is that a common symptom?—Yes, when they get very bad.

17,908. In most cases?—In most cases when they get very bad

17,909. Is it an early symptom?—No.

17,910. When does that appear?—After the air cells get nearly clogged up.

17,911. I am speaking now of symptoms of a thickening and therefore a contraction of the bronchial tube independent of the air cells?—You mean a thickening of the lining?

17,912. Yes?—That will occur with congestion.

17,913. Or with inflammation?—Yes.

17,914. Is it a common symptom?—Not till they get very bad, or have catarrh or violent cold along with it.

17,915 After these men get their lungs decidedly affected, and they leave their employment, do they recover again?—Partially, but never to get cured.

17,916. Does the disease cease to advance?—It seems to stop.

17,917. Does it certainly stop?—It stops for a time; if they get cold or any inflammation, or any congestion, of course they do not feel so well as a man does with sound lungs to bear it.

17,918 Has there been any marked change in the prevalence of this disease of late years?—There has not been so much of it.

17,919. Is there a marked diminution of it?—There is.

17,920 Do miners live now several years longer than they did 20 years ago?—They are more healthy a good deal.

17,921. They live to a later age?—Yes.

17,922. Do the majority of miners get this disease at some time or other?—No, unless they are working in bad air.

17,923 Do many miners escape altogether?—Yes.

17,924 They get even to advanced life without it?—Yes.

17,930. Have you observed that teetotlers are equally liable to this disease as those who are not so?—I should think quite so.

17,932 (*Sir Philip Egerton.*) Is the general health in this district good; is it a healthy situation?—It is a healthy district.

17,933. I mean exclusive of the miners?—Yes.

17,934. What are the prevalent diseases amongst the poor here?—They generally have bronchitis and disordered stomach and liver.

17,935. (*Mr Holland.*) From catarrh?—From catarrh.

17,936. (*Sir Philip Egerton.*) Is there much consumption amongst them?—Not a great deal.

17,937. Do you find that persons who are of a phthisical diathesis are more liable to catch asthma than strong constitutions?—I should think that they are.

17,938. In those cases is the ultimate result tuberculosis or hepatization as you have told us?—If they are scrofulous they will have tubercles.

17,939. Have you had many cases of tuberculous disease among the miners under your care?—I have; particularly those of a light complexion, and fair skinned.

17,948. (*Sir Philip Egerton.*) You have told us that in cases of incipient disease, you have recommended a healthier position in the mine?—A change of place. I have recommended the agents to let them have an outward place for a while, and then put them where there was better air than the place they had been occupying.

17,949. Have you found a disposition on the part of the agents to co-operate with you?—They generally have done so.

17,950. (*Mr. Kendall.*) Have you ever found any difficulty?—I have found difficulty. I have mentioned about the club being broken up. I wished the men who were smelting or working in dusty places to wear respirators, and to attend to their bowels regularly once a week with a little calomel and colocynth or something of that sort, to keep the liver in order, and there was a rebellion about that.

17,951. I refer to the fore-heads where the air is bad; did you ever know an agent refuse to change parties?—No; the parties were changed.

17,952. On your recommendation?—Yes.

17,953. They were always changed?—Yes; they were all ready enough to change.

Mr. Jonathan Coatsworth, Keld Heads Mine.

18,039. (*Mr. Kendall.*) Will you give as near a guess as you can how many men in the year out of the 100 who work underground you think suffer, even in a small degree, from bad air?—That is a complex question; I do not know how to define that.

18,040. Do you think that five men out of 100 suffer within the year and are incapacitated from working in consequence of bad air;—It is my conviction that every man who works under the surface will suffer a little.

18,041. You think that every man suffers a little?—Yes, that is my conviction.

18,042. At what time of life do you think he begins to show that suffering?—A good deal depends upon what kind of workings he has been in. In the north you may begin to see some symptoms of it in some mines frequently at 30 years of age, and you may see a great deal of it at 40.

18,043. Do you know any men who have worked under you who are at this time in this neighbourhood and who are entirely done up, as far as working goes, who are not 50 years old?—No, not one. We have a great many above 50 working, and they do not seem to be suffering very much.

18,044. Do you know any men at all who have worked with you who are now entirely laid up on account of work?—There is one at Redmire, and the only one, an old man.

18,045. How old is he?—I do not know his age exactly; he is somewhere between 60 and 70.

18,046. You only know one instance in this neighbourhood of a man entirely unable to work in consequence of the miners' asthma?—No; and I believe it is more from an asthmatic affection which he has than anything else.

18,047. Is that asthmatic affection a peculiar one to miners, or a common one?—Some farmers are troubled with asthmatic complaints; men who have never been in a mine are troubled from asthma.

18,048. Out of 100 men that you employ every year, how many do you think are suspended from working in consequence of working in bad air within the year, even for a month?—Not one that I am aware of; we only have a single man off work now out of all that number, and it is a complaint in his spine, so a doctor at Richmond says, it is not from anything else.

18,049. Though there is a marked suffering among miners, yet it is not of a very grievous nature?—No; if you have mines properly ventilated men suffer comparatively little; but if they are badly ventilated men are crushed up and die away when they are 40 or 50 years of age.

Mr. William Barron, Craven Moor Mine.

18,264. (*Mr. Holland.*) Is there any peculiar disease among the miners?—Not in our parts at all.

18,265. Are they as healthy as other labourers?—I think that they are; we have one man 75 years of age.

18,266. But take them as a body, is there any asthma among them?—There is some, but very little.

18,267. Is there more than among agricultural labourers?—Yes, in any mine there is a little more than that; but I think that in the limestone district there is very little difference between them and the agricultural labourers, as they only work six hours per day, and all get home to their own houses.

18,268. Do they look as young as other men of their age?—Yes.

18,295. (*Chairman.*) What do you think the most injurious thing to the miners' breathing besides the bad air?—I do not think that powder smoke is a very injurious thing, but still if you have too much of it you spit a deal of black when you come out. I would recommend a squib wherever it can be used for the sake of making less smoke.

Mr. Henry Daykin, Grassington Mines.

18,435. (*Chairman.*) The men do suffer from working underground I suppose?—I should say that they will.

18,436. What do you think they principally suffer from?—I should think from the grit dust, that is the worst; that is my opinion of it.

18,437. More than from any want of air?—Yes, I think so.

Mr. Thomas Job, Hebden Moor Mine.

18,584. (*Chairman.*) Have you ever known any men suffer from working in mines?—No, not at Hebden Moor.

18,585. But have you in other mines?—Yes; I believe that in some cases they have suffered.

18,586. From your own knowledge do you know of any men who have suffered?—Yes, from the time that I was a boy, in consequence of their working hard and in wet places, and not having been careful enough of themselves they have shortened their age.

18,587. Have they been broken winded?—Yes; it may have that effect sometimes. I have myself worked in places where it was very dusty, in Devonshire. it was the gray slate strata there, and in some places it was very dry, and there it was worst; but if there was water and it was a wet place it had a tendency to prevent the dust from flying.

Mr. James Ray Eddy.

18,688. (*Mr. Leveson Gower.*) With regard to the health of miners do you see any difference in those different mines?—The most healthy miners that I know are the Shropshire and Derbyshire miners. I think that we have the least chance in the north of England, I am omitting altogether Devonshire and Cornwall. I think that the ventilation at Grassington, and the size of the levels, and all that sort of thing, have been on a better scale than in other mines in the north; but the small mines in the valleys between here and Alston Moor have, generally speaking, been carried on by small companies who would not spend money. Thirty years ago, when my father came here, a great part of these mines were worked by small companies, Derbyshire companies, and north country companies; and a great part of the miners came here originally from Derbyshire and the north country. The late Duke then took all the royalties into his own hands; and we have constantly had from time to time, in going over any of the old works, to enlarge their levels. It is not seven years ago that we opened out more than 90 fathoms of one level, which at that time was not more than 3 feet 6 inches high and 2 feet wide, and a man worked in that level nearly all his time, who stood 6 feet 1 inch high.

18,689. Do you believe that those small levels still exist in this neighbourhood?—Yes, in the small mines; they do not exist in this immediate neighbourhood in the present workings, but they are existing in the old mines as old works.

18,690. Do you think that there are any mines in operation at this moment near here with such small levels as those?—There are levels which are too small; but I think that that is not so general as it was. Mr. Taylor, of London, who works the Derwent mines, is very particular about large levels; and we have mostly here made what we consider pretty good sized levels, and I think that the other mines are following that.

18,691. To what do you attribute the better health of the Shropshire and Derbyshire miners as compared with the miners of this district?—The health of the Shropshire miners is better than the health of the Derbyshire miners, from the fact that they have no shales, no argillaceous beds, or very little. For instance, in Snailbeach, in Llandeilo Flags, there are no soft argillaceous beds in the working part of the mine. In this district I do not think that there is anything to damage the men's health, save boring in the grit stone; that is the bane of this country; and I believe that what I am trying to get the men into at the present day, namely, wearing a moustache, is the only preventive, and I would say the only sure preventive for it. The gritstone causes the mines of this county to be less healthy than those of the two counties named.

18,692. (*Sir Philip Egerton.*) You encourage that in the miners?—I do; but you will not find many of them wearing it.

18,693. (*Mr. Leveson Gower.*) Are there many miners who are teetotallers?—We have not many teetotallers here, but I think that we have a less per-centage of drunkenness than among any body of miners I ever knew. I am quite certain that we have less than among any body of miners I ever came in contact with.

18,694. Do you consider that there has been an improvement in that respect since you knew the district?—There has been an improvement resulting from temperance.

18,695. (*Sir Philip Egerton.*) Since you have been acquainted with this district, can you trace any improvement in the health of the miners; do you think that they are more healthy now than they were when you first came here?—I can see this very plainly, that those miners who have for the last ten years suffered the most from their working, and also those miners of the present day, who one would say are the worse for it, are men who originally worked in Arkindale and the northern country. We have in attendance here one man who has been working 57 years; all the men who are in attendance here have been working more than 30 years, and some of them are not more than 42 years of age; the youngest went underground at 7 and from that to 12 and 14, and I think that they are a very good sample; I am not at all afraid of showing them anywhere.

(Ab^{n}.)—AGE AND APPEARANCE OF MINERS.

Mr. Benjamin Plummer, Goldscope, Yewthwaite and Castlenook Mines.

13,717. (*Mr. Austin Bruce.*) Up to what age do miners usually continue to work?—We have men working at the mine now from 50 to 60 years of age I should think. I have only known 2 or 3 to die since I have been here, and they came from Alston Moor.

13,718. Do you observe any difference between the men who have been born and have always resided in this district, and the men who come from Alston Moor?—Yes, there is a very marked difference.

13,719. What is the difference that you have observed?—The difference is in the colour of the face, that is one thing that you will find; the Alston Moor men are principally of a sallow complexion, and suffer from short breathing, you see that in fact from their breathing when they are talking to you.

13,720. Are the men of this district who have not left it but who have worked from 18 years of age in these lead mines as healthy as the agricultural population?—No, I do not think they are.

13,721. Do any of your own men who have not come from a distance suffer from miners' asthma?—I do not know of any.

13,722. What do they suffer from?—They principally suffer I think from rheumatism and lumbago in the back, that is what they principally remain at home sick for, that is the doctor's certificate generally.

13,723. Have the men to work on their sides at all?—No; they are all standing up or sitting down.

Mr. James Postlethwaite, the Keswick Mines.

13,855. (*Mr. Austin Bruce.*) Up to what age do they work with you?—I can scarcely say. I had two old men who died last year who were 70 years old.

13,856. Had they worked up to the last year?—Up to the last. My father died two years ago at the age of 65.

13,857. Is there any difference in their appearance and that of the population who work above ground?—Very little indeed in these mines.

13,863. (*Mr. Holland.*) Is it common for miners to work until 60?—Yes, I should think it is.

13,864. Is it as common among miners as among farm labourers?—No, I should think not; decidedly not. Farm labourers are more healthy.

13,865. Are there as many miners as farm labourers do you think working at 50?—No, yet there are many working at that age.

13,866. Are miners more liable to affections of the chest?—Yes, I should think so.

13,867. Asthma?—Yes.

13,868. Does it often become very bad?—Yes. I have seen one very bad, and who can scarcely work.

Mr. William Phillips, Greenside Mine.

14,030. (*Mr. Austin Bruce.*) Up to what age do they continue to work in your mines?—We have some of them who are nearly 70 years of age, above 60 a good bit, at any rate.

14,032. (*Mr. Holland.*) Do the miners in this district look as young as other men of the same age?—Yes, they have rather paler complexions.

(Ab^{n}.) *Age and appearance of Miners.*

Mr. Tinniswood Millican.

14,346. (*Mr. Holland.*) At what age do you consider a miner an old man?—We consider a miner an old man at 50 or upwards, 52 or 53

14,347. Do you mean that when he reaches the age of 50 he is nearly done?—Yes, he is nearly done then.

14,348. Does he look a great deal older than an agricultural labourer of the same age?—Yes.

Mr. Josiah Remfry, the Derwent Mine.

14,910. (*Chairman.*) Are they not liable to catch cold coming out of those mines and going home in a wet state?—They are liable, but I presume that they do not very frequently catch cold; of the four witnesses whom we have here to-day one has worked underground I believe continuously for 58 years; the four will average 43 years and three months.

14,911. Do you know at all what would be the average age of the number of men who are working in the mine generally?—No.

14,912. What is the youngest age at which you allow any to go underground?—They are generally about 17 or sometimes 18 before they go underground.

Mr. John Richard McCollah.

17,120. (*Chairman.*) Do you suppose that they die earlier from this affection?—There is no doubt of it.

17,121. At what age should you say generally that miners so affected die?—Very few of the lead miners are able to work after they are 50 years of age.

17,122. Do you think that from going early to work as boys they are more liable to be affected, or that they become acclimatized to it?—There is no doubt that they are more liable to be affected by going into the mines very young, because the exciting cause is going on in youth just in the same way as it is in mature age.

Mr. Ralph Milner, Whiterside, Summer Lodge, and Beldhill Mines.

17,239. (*Mr. Holland.*) You have been acquainted with miners for 50 years, I think, you said?—Yes.

17,240. Have you noticed that their health has altered as a class in those 50 years?—They have improved. There are better way-gates, as we call them, and shafts; formerly they were very little.

17,241. Do you think that the health of the miners has improved?—Yes, no doubt it has, from good levels and shafts being put down.

17,242. Do miners attain a higher age now than they did in your youth?—Yes, I think that they do; but still it takes a good bit off their lives.

17,243. At what age do you consider a miner an old man?—I have known one 84.

17,244. But at what age is a man thought to be an old miner?—At about 50 or 55.

17,245. A small proportion survive that age?—A very small proportion.

17,246. At what age does the health generally begin to fail?—At 30 to 40 years of age.

17,247. Do they then begin to show the miners' asthma?—Yes.

17,248. Is that miners' asthma generally attributed to the stour which you speak of?—I think that it is the dust which comes off the rock which is the cause, in some hardish mines they have to work with the pick and a stour comes off it, even if it is well ventilated, which affects men.

Mr. Robert Daykin, Hurst Mine.

17,494. (*Mr. Kendall.*) From your recollection, do you think that miners live longer now than they used?—No, I believe not. I do not think that there is any alteration whatever.

17,495. Do you think that they are a short-lived class of men as compared with the agriculturists, or not?—I think that they are shorter lived.

17,496. Do they live imprudently?—No, I do not think that they do; but I think that the mines to a certain extent may affect them, and besides that they have not always good accommodation in their houses.

Mr. Thomas Edmundson.

17,941. (*Sir Philip Egerton.*) Can you give us any estimate of the comparative length of life between the miners and the other inhabitants of the district?—The miners do not live so long, but it all depends upon the healthy state of the place in which they work. I think that if the air was free from dust, and they were not

(Ac^{n}.) *Food of the Miners.*

(A^{n}.) HEALTH AND DISEASES OF MINERS.

exposed to water dropping on them during work, they would live quite as long as any other inhabitant, barring accidents.

(c^{n}.) FOOD OF THE MINERS.

Mr. John Walton.

16,042. (*Chairman.*) How do the miners live, have you ever seen anything of the mode of their living in their cottages?—Yes; they live well.

16,043. Just as well as an agriculturist would live?—Better.

16,044. In what respect do they live better?—I think they use more animal food than is used by agricultural labourers

16,045. Probably they have better wages?—They have better wages.

16,046. What kind of food do they eat?—Beef and mutton principally.

16,047. What is the price of the beef and mutton?—7½*d.* and 8*d.* a lb. at the present time.

16,048. Most of the miners have some little land of their own?—Yes; small farms, either as owner or tenant.

16,049. What extent of cattle do some of them keep?—Two or three cows, some of them have as many as four cows.

16,050. And they take great delight in their farms?—Yes, they do.

16,051. And they support the agricultural meetings?—Yes.

16,052. And they show their cattle?—Yes.

16,053. They have also horticultural meetings?—Yes.

16,054. And they exhibit the produce of their gardens?—Yes.

16,055. And in fact the society is supported almost entirely by the miners themselves?—Yes, in a great measure.

16,056. Do they get any support from the neighbouring gentry or proprietors?—Yes.

Mr. Jonathan Coatsworth, Keldhead Mine.

18,061. (*Sir Philip Egerton.*) Do they live pretty well as respects food?—Yes, I dare say they do; the men earn very fair wages, and that places good food within their reach.

18,062. Do they bring their dinners with them to the mine?—They take a little with them.

Ac^{n}.) *Smel-*
rs.

(e^{n}.) SMELTERS.

Dr. James Rumney.

14,066. (*Mr. Holland.*) Have you noticed this disease among the Alston men and not among the men of this district?—I have not noticed it much among the men here; lead paralysis is more common here, and dropping of the hand.

14,067. Among the miners?—Among the smelters.

14,068. Not among the miners?—No; it is accompanied with lead colic.

Mr. John Richard McCollah.

17,163. (*Sir Philip Egerton.*) In the opinions which you have given do you include the persons employed in the smelting works as well as those in the mines?—I see less disease of that kind amongst the smelters than amongst those working in the lead mines

17,164. But in the evidence which you have given do you include those who are employed in the smelting works, as well as the miners?—Yes.

17,165. Is the disease common to both?—It is common to both, but it is not so common to the smelters as it is to the lead miners.

17,166. Are the smelters exposed to dust, which you say to a great extent, causes miners' asthma?—No, they are not.

17,167. Then how can you account for their having the disease?—The construction of the smelting mills is now very much improved, and the ventilation quite superior to what it was 30 years ago; consequently you rarely see the disease amongst young men working in the smelting mills, whilst amongst the older men it is a common complaint.

17,168. I understood you to say that the dust had a considerable effect in producing this disease?—It has.

17,169. But the smelters are not exposed to dust?—They are not exposed to dust, because the smelting mills are generally well ventilated.

17,170. But still they are subject to miners' asthma?—They are.

(Ae^{n}.) *Smelters.*

17,171. Do you think that climatal causes have anything to do with this disease?—No.

17,172. Then I cannot understand how you account for the smelters being subject to the miners' asthma, although they are not exposed to those influences which you say induce it in the miners?—You occasionally see it among the smelters, but not nearly so frequently as among the men who have to work under ground.

17,173. Do you suppose that it is infectious or contagious?—Not at all

17,174. Are the smelters exposed to any noxious vapours from the operations which they conduct?—Not that I am aware of.

17,175. You have no cases of lead poisoning?—I have often thought that there is a possibility that they might suffer from absorption by wearing their flannels too much without washing. Indeed, I believe that the lead miners themselves do not attend sufficiently to the bath. I think that if they were to have a bath once or twice a week to cleanse the pores of the skin, they would suffer less from bronchial disease.

17,176. Do you find any diseases peculiar to the smelters?—No, not here. I never remember having seen more than two cases of paralysis which I attributed to smelting.

17,177. (*Mr. Holland.*) Lead paralysis?—Lead paralysis.

17,178. (*Sir Philip Egerton.*) As a whole you think that the smelters are a more healthy set of people than the miners?—Yes.

Sir George William Denys, Bart.

17,402. (*Mr. Holland.*) Not till then?—No; I think that generally speaking, they are a fine, healthy class. The smelters have an unhealthy appearance, but that is an unhealthy occupation. If the mill is ever so well ventilated they must inhale a certain portion of the sulphur during the process of smelting.

Mr. Thomas Edmundson.

17,876. (*Mr. Holland.*) Have the smelters a disease of the lungs peculiar to themselves?—I think not. It generally affects the bowels in the first instance; they complain of the bowels being stopped, and they say they are "belloned." The obstinate costiveness will last for a week or ten days, and they die if not relieved. I have recovered two cases which had been attended for eight or ten days by other medical men, by introducing the tube of a stomach pump 12 or 18 inches long up the rectum, and throwing up at the least three pints of liquid; repeating it till the bowels were relieved. Repeated attacks will end in paralysis.

17,877. You are now speaking of the smelters?—Yes

17,878. Have the miners anything of that sort?—The miners who do not come into the smelting house are not under the affection of the fumes of lead.

17,879. They have no colic, have they?—They have no colic

17,880. Have they much disturbance of the digestive organs?—Much.

Mr. Matthew Newbould, Sunside Mines, &c.

18,211. (*Mr. Kendall.*) Do you smelt your own ore?—Yes.

18,212. What sort of health have the smelters?—One of them died not 12 months since, and he was about 64; and he was a smelter from nine years of age.

18,213. His health was very good?—Yes; his father was a smelter, and he lived till he was between 70 and 80.

18,214. (*Mr. Leveson Gower.*) Is the smelting done in the open air?—No, it is covered up.

18,215. Are the dressers covered over?—No.

Mr. James Ray Eddy.

18,661. (*Chairman.*) You smelt the ore at Grassington?—Yes; we smelt all the ore here, and do likewise at Conoley and at Snailbeach.

18,662. You have turned your attention particularly to the smelting?—Yes; I paid particular attention to the smelting in the early part of my time here.

18,663. Do you think that it is very efficiently done?—I believe that the smelting at Grassington is as perfect as it is possible to make it; indeed it is acknowledged by large smelters to be better than theirs, but it arises from the simple fact that our men here have been for so long a time accustomed to one class of minerals only that they are quite masters of the thing, whereas at other works where they buy all classes of ore, it is a continuous change.

(B^{n}.) MODE OF ACCESS AND EGRESS.

Mr. James Postlethwaite, Keswick Mine.

13,779. (*Chairman.*) Do the men go down by ladders?—They go in both ways; some we take down by the engine, just as the men choose; others go by ladder.

13,780. What have you on the engine; is it a skip or a cage?—A cage.

13,781. A safety cage?—No, we have not a safety cage.

13,782. You bring up the ore in waggons?—Yes; it runs into the cage.

13,783. Do you call them bogies?—Yes.

13,784. Have you ever had any accident from the men going down?—No; we had one man killed by the cage coming in contact with him; he placed himself in the way of the cage as it was going down some years ago, and it broke his arm, and he fell and was killed; that is the only accident that we have had; we have never had a cage fall.

13,785. (*Mr. Holland.*) Was he in one of the higher levels?—He was in one of the middle levels.

Mr. George Henderson, Fallowfield Mine.

15,417. (*Chairman.*) How do the men enter the mine?—They have a climbing way, and they also go down the shaft.

15,418. Is the lode followed from the adit by the climbing way?—It is down from the surface.

15,419. Do the miners go down the shaft in cages?—Yes.

15,420. Are there any safety catches to the cage?—Yes.

15,421. Does it work well?—Yes.

15,422. Have any accidents ever occurred?—Never in the shafts.

15,423. Has no accident occurred from the use of the cage?—No, we have never had an accident in the shaft at all.

Mr. William Curry, East Allendale Mines.

15,809. (*Chairman.*) How do the men enter the mines?—Part of them go in by an incline, and the other part down the shafts. They are drawn up in cages.

15,810. How are they enabled to ascend and descend the shafts?—By machinery, the principal part of them.

15,811. How do they go down?—The shafts are partitioned, and they go down in tubs or cages.

15,812. Is it the patent safety cage that is used?—It is not

15,813. Do you ever have any accidents in these mines?—Not with the exception of one or two, when coming up the shaft. At the top the framing is closer then below, and by carelessness had their heels outside the cage and were bruised.

15,814. Is the machinery worked by hydraulic power?—Yes.

815. What is the lowest level in which the men descend?—The deepest shaft that we have is 93 fathoms; but when I say that a level goes into the side of a hill, and the depth taken from it, there may be, perhaps, 50 fathoms above that to the surface.

15,962 (*Chairman.*) You have no means of putting a man engine, or a skip, or anything of that kind below, to let the men down?—We have not adopted anything here. At Shttshaft, a mine further down the district, we are preparing means. There has not been anything employed here yet; but at the fore end, where they are about to put in the engine, it will be adopted with the skips or cages

15,963. In fact you have no means of doing it at present, because you have no top to your shaft?—Not at present, but that will be put in operation within 12 months in the fore end.

16,004. (*Mr. St. Aubyn.*) We saw to-day at Allenheads Mine the men ascending and descending by means of a cage with a wire rope, where there was a top to the shaft, do you intend to carry that out in this mine also?—The same system is proposed to be adopted and is being carried out at some of the shafts here which is already in existence at Allenheads.

16,005. Namely cages and wire ropes?—Yes, the same sort of machinery.

16,006. Is it in contemplation to erect that generally in the mines in this district?—I cannot say that: there is one shaft which has been fitted up very similar to Allenheads, upon the principle that is adopted at Allenheads, with hydraulic engines, and lowering and raising the men by skips or cages.

16,007. Have you any reason for adopting the cage in one shaft and not in another?—There is no particular reason excepting that that improvement has not taken place in the whole district which is carried out in Allenheads, which it is very likely intended by degrees to carry out.

16,008. In your opinion, then, the cage and the wire rope is an undoubted improvement upon the footways?—Yes, I think that it is an improvement to the pathway.

16,009 (*Chairman.*) I suppose one reason is that you have not a shaft here which will suit that?—It is not sufficiently large, and it is not adapted to the purpose, but we are fitting one up in this mine exactly similar to what is carried out at Allenheads, that is near the fore end.

16,010. (*Mr. St. Aubyn*). Where the shafts suit it is the intention to fit up cages?—I cannot say what the intention is, but from what has really been done it appears to me that that is very likely the intention.

16,011. And in your opinion where it can be done it is preferable to the footways?—Decidely.

Mr. John Walton.

16,139. (*Mr. St. Aubyn.*) Do you agree in the opinion expressed by Mr. Cain that it is very desirable to establish the use of cages and wire ropes where it is practicable, instead of the footways?—Yes.

16,140. And it is being done as fast as s convenient, is it not?—Yes, it is.

16,141. (*Mr. Kendall.*) Have you ever known of any accident in cages?—No.

Robert Walton Bainbridge, Esq., Teesdale and Alston Moor Mines.

16,166. (*Chairman.*) When they go down the shafts, do they go by ladders?—Yes; not by buckets.

16,167. Do you mean by stempling?—Not by any machine, we have ladders, it is not by stempling

16,168. What is the greatest depth that the men may have to go down in any shaft?—You may take 20 fathoms as the utmost extent, it is very often much less

16,169. You would not think it desirable to have stempling?—No, I should think not; those stemplings are very apt to rot at the ends that go into the rock, and they might break almost without the knowledge of the parties that they were so near the point of breaking.

16,170. (*Mr. Holland*). They are dangerous and also uncertain?—Yes, after a certain length of time; they are safe in the first instance.

16,171. (*Chairman.*) You would consider it a dangerous mode to adopt?—Yes, I consider it an objectionable mode of ascending and descending a mine, and such as we do not at all adopt in our present mines.

16,172. Have you got iron steps to the ladders?—No; flat wooden staves.

16,173. Are they tenoned into the uprights?—Yes, into the sides.

16,174. When you use ladders, what divisions are there, or sollers?—We have divisions where one side of a shaft has to be used for the men ascending and descending, and the other side has to be used for the purpose of putting down the work

16,175. They are divided, are they?—Yes, they are; but in general we endeavour to get what we call our hoppers between the place where the men are working and the horse level; we have these at every 10 fathoms, and these are not used for the men to ascend or descend by; but exclusively for putting down the work.

16,176. (*Mr. Austin Bruce.*) If a man were to fall in your 20-fathom shaft, how many fathoms might he possibly fall without being stopped?—To the end of the ladder; I believe the length is about ten feet.

16,177. At the end of each ladder is there a stage to prevent a man falling?—Yes.

16,178. What is that called?—We call it the landing.

Mr. Francis Taylor, Old Gang Mine.

17,516. (*Chairman.*) Do the men always go in by the level, or do they go in by the shafts?—They generally go by the shafts; unless they may meet with a horse going up, and he takes them up.

17,517. And they go down the stemples?—Yes.

(B^n.) MODE OF ACCESS AND EGRESS.

(B^n.) *Mode of Access and Egress.*

Mr. Matthew Newbould, Sunside Mines, &c.

18,129. (*Chairman.*) Do the men go in by the level or do they go by the shaft?—They go both ways, by inclines and some nearly perpendicular, and sometimes by the levels.

18,130. Do they go down by ladders or stemples?—Mostly by stemples at the Sunside Mine.

18,131. Have you any ladder ways?—None to speak of; I think that we have not 20 yards of ladders in the whole mine.

18,132. Do you think that the men prefer stemples to ladders?—They are more convenient for our mine than ladders would be; we have not many deep shafts to climb, up, they are more inclined.

Mr William Barron, Craven Moor.

18,236. (*Chairman.*) How do the men go to the work?—They go down ladders chiefly.

18,237. They go down a shaft?—Yes, 56 fathoms.

18,238. How many shafts have you?—One.

Mr Benjamin Calvert, Nedderdale Mining Company.

18,323. (*Chairman*). How do the men go into the mine; by the adit level?—They can take either way now. There is very good accommodation either way.

(Ba^n.) *Ladders.*

(a^n) LADDERS.

Mr. John Barratt, Coniston Mines.

13,364. (*Chairman.*) How do the men descend into the mines?—By ladders.

13,365. Do they go in at the adit level?—Yes, and then they descend.

13,402. (*Mr. Kendall*). Do the old miners complain of having to climb the ladders?—Yes, and they object to go down, but no so with young men.

13,403. What is their reason for not wishing to go down?—The labour is very great for men to descend as low down as 150 fathoms.

13,491. (*Mr. Holland*) When a miner desires to be employed in the upper levels, is that to avoid the climbing?—Yes; they say that it is easier work. We put the young men down into the bottom.

Mr. William Mitchell, Coniston Mines.

13,533. (*Chairman.*) Do the men ever complain of having to climb up the ladders?—Yes, they complain of that; it is very fatiguing and exhausting after doing a hard day's work.

13,534. Do you think that that prevents any of the older men from going down?—Yes; when the miners get old and infirm they are not capable of doing it.

13,535. I suppose you would rather have experienced men to work in the mine than inexperienced men?—Yes, decidedly; there is nothing like a man being trained up from boyhood into it as a miner, for they require experience.

13,536. Then the circumstance of having to climb the ladders may prevent experienced miners from being employed in the mine?—Yes.

13,537. Have you ever been yourself in a skip or a cage? Never in a skip. I have been down by what they call the man-engine in Cornwall.

13,553. (*Mr. Davey.*) But the principal part of your men do not go to the bottom of the mine and of course they do not suffer from climbing?—No, they do not, it is only some part of them that go to the bottom; some men can walk in and out without climbing.

13,554. Are the younger men employed in the deeper part of the mines?—Yes, we generally select them for going to the deep works.

13,600. (*Mr. Holland.*) You stated that you were satisfied that if the men were lifted up and down there would be a great saving of expense both to themselves and to their employers?—Yes.

13,601. Have you observed that the men in the high levels can do more work than those who are employed in the lower levels?—Yes, they can do one-fifth more.

13,602. Have you ascertained that as a fact?—Yes.

13,603. Is that because they are saved the trouble and fatigue of climbing?—Yes.

13,604. (*Mr. Austin Bruce.*) Is not the temperature greater down below?—Yes.

13,605. Has not that something to do with the difference of the amount of work performed?—Yes; it will cause more fatigue.

(Ba^n.) *Lad*

Mr. James Postlethwaite, Keswick Mines.

13,869. (*Mr. Holland.*) There is not much climbing in any of the mines here, is there?—There is climbing of the ladder.

13,870. How deep is it?—Only about 50 fathoms.

13,871. And many do not climb so far as that?—No.

13,872. Many 20 or 30 or 40 fathoms?—Yes, and then we take the men up by the cage, if they choose it.

Mr. Thomas Watson, Alston Moor Mines.

14,459. (*Mr. Davey.*) Do you observe any difference in those men who have to climb those ladders and the other men who have not?—Yes, of course it is very exhausting to climb ladders; but it is so little that the young men do not find a great deal of inconvenience from it; the old men, whose breathing has become bad, are put to the greatest inconvenience.

14,460. You do not place old men, I presume, in that position?—Not generally so.

Mr. Josiah Rempry, Derwent Mine.

14,854. (*Chairman.*) How do the men enter the mine?—Through the adit level first generally. Some leave at the shaft top; but the main bulk of them go through the adit level first.

14,855. How do the men who enter by the adit level afterwards enter the shaft?—By ladders.

14,856. How do the men descend who go down by the shaft?—They do not generally travel in the shaft, sometimes they do. But there are footways on the working of the vein; there are ladders put in this, and the principal part of the men travel in that way in preference to going down the engine or any other shaft.

14,857. Why?—because the footway is not continuous. Perhaps we go down for four fathoms, and then we may walk.

14,858. The shaft or shafts which go down from the adit level have continuous ladders I suppose?—Yes; the principal shafts, as shown on the section, the engine shafts; they are continuous and perpendicular from the surface down.

14,859. What length is each division of the ladders?—Some are $3\frac{1}{2}$, and from that to 4 fathoms.

14,860. At the end of each ladder is it sollered over?—Yes, with a man-hole and a guard at the foot of each ladder. We always keep a guard or a hand-rail.

14,861. Have the ladders iron staves or wooden ones?—Wooden staves.

14,862. Are they round staves or the four-inch square staves?—Four inches by three-quarters, made of larch.

Mr. Joseph Cowper Cain.

15,954. (*Chairman.*) Have you any continuous ladders going from the horse level?—They are continuous, but there is a little distance sometimes between the different stages for the different levels; but they may be considered continuous.

15,955. What is the length of a ladder?—Generally 12 feet.

15,956. Have you a stage at the bottom of each ladder?—Yes.

15,957. What is the inclination of the ladder for climbing?—I could not state it in figures, but it generally goes half-way through the shaft across the way gate.

15,958. How wide is the shaft?—Perhaps 5 or 4 feet.

15,959. Then it would be about $2\frac{1}{2}$ feet in 12 feet?—Yes.

15,960. Do the men complain at all of climbing the ladders?—Not at all. I have not heard of any complaints.

15,961. Do they suffer much from climbing?—I do not know that they suffer a great deal; they must suffer from it, of course.

Mr. John Walton, Allenheads Mines.

16,034. (*Chairman.*) From the horse level you go down 131 fathoms?—Yes.

16,035. Did you ever hear any complaint from the men of climbing that ladder?—No, I never heard them complain of the climbing.

16,036. They do not climb continuously?—No, they have stages of so many fathoms, and then they take a rest.

16,037. I do not mean continuously in the shaft, but do they go to a rise and then to a level and then rise again?—Yes.

16,038. Therefore it is not continuous from the shaft?—It is not.

(B^{n}.) MODE OF ACCESS AND EGRESS.

: Ladders.

Mr. William Barron, Craven Moor Mine.

18,269. (*Sir Philip Egerton.*) I think you say that the men go to their work by ladders?—Yes.

18,270. Is it usual in this district to have ladders?—A good many of the miners in this district go in by ladders

18,271. Which do the men prefer, ladders or stemples? Ladders; but I do not prefer having the ladders so long, because when you put in a ladder 20 or 30 feet long you make a stage, so that when a men gets up it, it is a little bit of relief.

18,272. (*Mr. Holland.*) You make a little slope?—Yes.

18,278. (*Mr. Kendall.*) Did you ever know a case where a miner quarrelled with the ladders, but where after the use of ladders he preferred them to stemples?—No, I never heard of men making any objection to a ladder.

18,279. (*Mr. Holland.*) If ladders were put too long the men perhaps would object?—I think it is dangerous.

18,280. And is it not laborious?—Yes.

18,281. It is very hard work?—Yes.

18,282. (*Mr. Kendall.*) How frequently are there rests in your ladders generally?—From 21 to 30 feet.

18,283. What is the size of the hole through which the men go down?—Two feet.

18,284. The whole of the rest is covered over?—Yes.

18,285. (*Mr. Holland*) How long is the floor?—It depends upon the size of the shaft; our shaft is six feet, and we slant the ladder.

18,286. You have a slant of about 5 feet in every 30?—Above three feet.

18,287. That is very steep?—No; the first ten fathoms that we go down we go right down one ladder almost.

18,288. (*Sir Philip Egerton.*) In case of a man missing his hold, are your stages strong enough to prevent his falling?—Yes, quite.

) Man-

(b^{n}.)—MAN-ENGINE.

Mr. William Mitchell, Coniston Mines.

13,550. (*Mr. Davey.*) Have you been down the mines by ladders?—Yes, and also by the man-engine.

13,551. Have you had sufficient experience to feel justified in recommending anything of that kind to your adventurers?—It is a very expensive affair, and we know that it is very beneficial, but still it takes a good deal of money to carry a thing of that sort out, and it is not every company that can find the means to provide a man-engine.

13,552. Have you any idea what the saving would be to the men?—It would be a great saving to the men, and I should think to the masters. I think that the miners could do one fifth more work, as compared with climbing the ladders in these very deep mines, if one came to work it out.

) Wire

(d^{n}.)—WIRE ROPE.

Mr. James Ray Eddy.

18,665. (*Chairman.*) You make extensive use of the wire rope?—Most extensive.

18,666. For all your drawings?—Yes.

18,667. And for drawing at all angles?—Yes I have brought with me specimens of different wire rope which have done service This rope (*producing a specimen*) has six strands of six wires, No. 12; it is one of Newall's, made in 1844; it has let down about 200,000 tons upon a self-acting incline, 60 yards short of one mile long, independently of the waggons, which would amount to about 18,000 tons besides. That rope never broke in 14 years workings. We took it off thinking that it had done enough duty. I have tried to keep within the mark in the figures which I have given, and I think that it would turn out to be more if properly gone into.

18,668. Your experience of wire rope is that it is more economical to use than chains?—There is no comparison.

18,669. And how is it with regard to hempen ropes?—We could not work hempen ropes where we work these wire ropes on account of their dead weight. In the rope which I have produced there are six strands of six wires, No. 12, that is what we used to work formerly. The centre core is hemp, they now sometimes make them of a mixture of gutta percha and hemp, which I believe works pretty fairly.

18,670. You find no difficulty in working it with an angle?—None. This rope (*producing another specimen*) is a six strand rope, No. 12 likewise, but there is a peculiarity about it which I do not think advisable. In two opposite strands they have inserted instead of a hempen centre, a wire centre, I do not think that is advisable. If that rope was closely examined I believe it would be found that the twist in it in the course of working would not be uniform, in other words, I think, that by placing the extra wire in it the rope has greater rigidity in a certain position than in any other. That is the argument which I go upon; I have not examined the rope, but I think that would be the result. This (*producing another specimen*) is a new rope which has not done any work.

(B d^{n}.) *Wire rope.*

18,671. Which do you think more durable and safe, flat wire rope or a round rope?—Weight for weight, decidedly a round one.

18,672. Will you state your reason for that opinion?—My reason for it is this, that taking it weight for weight, it is the faggot of sticks exemplified. In a flat rope you have so many pieces of roundish ropes stitched together, so that the whole load is never borne uniformly upon every part of that rope. In a round rope it is always borne uniformly by every single wire; but in a flat wire rope the strands will never bear at any two different moments exactly the same load, it is tearing at one side or the other. We work a flat rope at Snailbeach, in a shaft more than 400 yards deep. The rope with the two wire cores in it has drawn at Grassington mines during nine years certainly not less than 10,000 tons, besides the dead weight of the kibble. That part of the mine is exhausted. Of the two ropes which I have produced one has been drawing perpendicularly and the other at an angle.

18,673. (*Mr. Kendall.*) Do you get these ropes all from the same manufacturer?—No; formerly we got all from Newall's. My father was perhaps the first person that ever used a wire rope in a mine.

18,674. How do you manage now?—We have changed and find a material improvement. I know that all the Cornish ropes are from Henry Morton, of Leeds, and I have no reason to complain of them, because I have never tried them. I get ropes now from Garnock and Bibby, of Liverpool, and am trying one from Edge and Son.

18,675. (*Chairman.*) If anything gave way in the wire rope, at what point would it give way?—We have had the greatest difficulty (I am speaking now of those years when we knew less about wire rope than we do at the present time) at places where we wanted to make connections on the one hand with two lots of rope, or on the other for attaching the tail chain to the rope. We put on a thimble, and the difficulty has arisen when the neck of the thimble pressed hard upon the rope. If the thimble went over the pulley-head (under the above circumstances), we sometimes used to neck the rope, and it would go away from the thimble before we knew anything about it; but with care and observation we have been able to get over that difficulty; we have not necked one for the last five years and a half, which is a proof that the safety is comparatively certain.

18,676. With a continuous wire rope you would think that there would be no danger?—We never lost the coupling off that rope (*pointing to one of the specimens*); we once broke a piece away from this rope (*pointing to another of the specimens*) working in a shaft 57 fathoms deep, by plucking at the sheeting and dividers; but we never broke that rope anywhere but at the coupling, so that there are two ropes there which have drawn together about 240,000 tons without a break.

18,677. (*Mr. Holland.*) Will you describe the improvement of the thimble?—Our mode of putting on the thimble is this:—If we put on the thimble to this rope we should separate and open the strands of the rope. Having done so we should bend every strand back over as near right angles as possible, for a length of about 8 or 9 or 10 inches, depending upon the kind of coupling which we were going to put in. A coupling for connecting ropes is usually put in longer than one which we should pass over a pit-head pulley, though we always take care if possible so to arrange the chain and the landing place that there shall be no occasion for the coupling to go over the pit-head pulley. We then wrap the whole with old hempen rope, putting the greatest covering of wrapping on to that part of the rope on which the sharp ends of the thimble would bear. The thimble is made in two wings, connected together and riveted through the rope with four or five rivets, care first having been taken to chamfer back the inside of the ends of the iron wings. The iron embraces in it two arms, and we take care to chamfer back the inside of the end of the iron, so that if there should be a bend of the rope it allows a little play before the sharp end of the iron touches it. We never dragged one; that is to say, we never tore a thimble off, which shows that the system of putting it on is sufficiently strong.

18,678. (*Chairman.*) In the angles and ends, what course

(B dn.) *Wire rope.*

do you adopt to prevent the wearing of the rope?—We have small pulleys.

18,679. You find that quite sufficient?—Quite sufficient.

18,680. So that that rope would be used at any workable angle, although a curve of a small radius would render the use of a wire rope impracticable?—At any workable angle. As a proof of that, at the Burlington Slate Works, upon one of the shorter inclines (not the one to which I alluded before) there are two reverse curves, and speaking without having measured them, I take it that one curve is of as small radius as 30 feet, and the other is perhaps of 45 or 50 feet radius, which is very sharp. They are self-acting inclines.

18,681. (*Mr. Kendall.*) That they bear?—Yes.

18,682. (*Mr. Holland.*) How many pullies do you want to turn that curve; three?—We put as many as are necessary; we have no rule for that. We are forced to put them to the outside of the inside rail. This is a plan of the lines of wire rope now in use at these mines (*producing the same*). It is on a scale of 40 yards to the inch. There is no other mine in the world which has used so much wire rope as this mine; and I think I can say that no other person in the world uses more wire rope than I do. We have been drawing at Grassington mines from one shaft 960 yards from the machine; that is the length of the rope on the surface in a straight line, independently of the angles, and the depth of shaft is 120 yards more. We have been drawing at another shaft 1,320 yards, and at another nearly 1,300 yards, besides angles and depth of shaft.

18,683. (*Mr. Kendall.*) Did you ever work that distance with a hempen rope?—No, the furthest that we ever worked with such a rope was 640 yards. I believe that it was with a hempen rope; but it was before I remember.

18,684. (*Mr. Holland.*) Have you ever worked out the fraction of loss?—No; but my father did so very minutely, and the difference between hemp and wire rope is so great, that it does not admit of the slightest comparison. In working at the farthest shaft the men have a signal made to them twice in the morning only. A hempen rope would with the alternations of wet and dry, and with the day's work, have altered in length some feet. We could not have drawn back the hempen rope on account of the weight. The small wire ropes weigh about 6 or 6½ lbs. to the fathom; they come to us about 3-inch ropes, and the one which has been working nine years is drawn down to about 2½ inches. In the new new rops we have improved it; we find it advisable, instead of having six strands of six wires, of No. 12 wire, to increase the number of wires and reduce the strength of each wire; and we now work them with six strands of eight wires, of No. 13 gauge.

18,685. (*Chairman.*) What is the price of these wire ropes?—They are 38*s*. a cwt. at the present time.

18,686. (*Mr. Kendall.*) What does a fathom weigh?—A fathom of that rope will weigh, I think, about 7¼ or 7½ lbs. By increasing the number of wires, it increases the weight a little; the 3½ inch wire new will weigh 9½ lbs. per fathom.

(B en.) *Stemples.*

(en.)—STEMPLES.

Mr. THOMAS WILSON CRAWHALL, Rodderup Fell Mine.

14,639. (*Chairman.*) Do the men ascend from one level to the other by ladders?—We have none at Hudgill Burn. At Rodderup Fell they generally ascend by ladders, or in temporary cases what are called stemples; we put in strong pieces of wood about as thick as your arm, one on each side, one here and at a foot or two another on the opposite side, and so on. In the small rises, I think that stemples are much better than ladders, they are easier; they are better, I think in the very small places.

14,640. What is the greatest height by means of stemples that you would let the men climb?—We have not generally places very high, it may be 20 fathoms.

14,641. In going the 20 fathoms is there no soller across; is it one continuous rise?—There is generally some break in it.

14,642. Is not a man more likely to fall?—He cannot fall; they are too small.

Mr. JOHN RIDLEY, Colcleugh Mine.

15,470. (*Chairman.*) Do they climb at all by stemples?—Yes; sometimes when the rise is not quite finished; but when there is a regular way gate, ladders are put in.

Mr. ADAM BARKER, Whitarside and Summer Lodge Mines.

17,079. (*Mr. Leveson Gower.*) How do the boys get up and down the stemples?—They are assisted by their fathers; the father guides their feet. I have done that myself many a time when I had charge of boys.

(B e. Stemples.

17,080. Do you remember any accident to boys going up the stemples?—Yes, I remember one; a boy who tumbled down a place at Surrender, and he died from it.

17,081. Is that the only accident which you remember happening to a boy?—No, there was another, a little boy with his father. He slipped past him at Surrender New shaft. That may be about five years ago.

17,082. Do you remember any other cases?—I do not remember any other cases. These are things which I have never looked at in that shape. I think that I have heard my father tell of a boy at the same shaft tumbling past his father.

17,083. (*Mr. Holland.*) Were all those boys killed?—Yes; and I remember very well catching a boy of about my age. Three of us were coming up at Surrender mines and we had got near to the top and he slipped, and he said "Ho!" I had him upon my shoulders.

17,084. (*Mr. Leveson Gower.*) Do the fathers ever take any precaution to prevent the boys falling?—Yes.

17,085. What precaution?—They have had them strapped to their bodies. They get these little boys into the waggons to ride up the level if they possibly can.

17,086. Do the boys usually go up the stemples?—Yes, but they let them down by rope where a rope is on.

17,087. I thought you said that they guided their feet?—Yes, they do, when climbing.

Mr. THOMAS COATES, Arkindale and Fell End Mines.

17,315. (*Chairman.*) Are there any ladders in the Danby level?—No; we climb by feet and hands.

17,316. By stemples?—Yes.

17,317. Would you prefer ladders or stemples?—Stemples.

17,318. Why?—For this reason. I have been down in Craven visiting some mines, the first that ever I saw, and when I saw the ladders I may have been nervous, but I dared not have gone down them if I had had all Craven, because I was afraid; if the cramp had taken my hands, I had nothing to support me but my bare hands, whereas in our way-gates I can tumble myself in any shape that I like.

17,319. What security have you that the stemples are fixed firm?—We drive them between two sides.

17,320. Do the two sides get loose?—Never, unless the work is too heavy in the hopper, or something of that sort.

17,321. Suppose a man misses and does not find the stemple?—He contrives to catch with his foot or something of that kind, but I never miss.

17,322. But if a stemple is out a man may fall?—If a stemple is out he may look out for a corner to put his foot too

17,323. How do boys manage to go down?—If a boy is a very young one his father takes him on the top of his back.

17,324. Does he attach him to himself?—It just depends upon circumstances; if it be a deep shaft or a deep sumpt he will do so; but they do not take them to work when they are so young, but they take them to receive the money.

17,325. Do not they take them down to hold the jumpers sometimes?—Yes, when they can do so.

17,331. (*Chairman.*) Did you never hear of any boys being killed from falling from the stemples?—I never heard of a boy being killed by falling down in that way.

Mr. FRANCIS TAYLOR, Old Gang Mine.

17,518. (*Chairman.*) Have you ever had an accident from the stemples?—Never since I have been agent.

17,519. How do the boys go down the stemples?—They can go down as well or better than men: boys take no harm.

17,520. You think stemples quite safe for the boys to go down?—Quite; because they generally go above their fathers, and the father is there to show them light.

17,521. The father helps them down?—He never has much occasion to do so.

17,522. Have you ever been in a mine with ladders?—No, not for any length of ladder; I have for a few fathoms.

17,523. Would you prefer to have ladders or stemples, if you had to go up and down?—Any person that I have ever talked to about the matter who has worked where others were, has quite preferred stempling.

17,524. (*Mr. Kendall.*) Those who have tried both prefer stemples?—Yes.

17,525. Supposing you had a ladder, must you not have stemples also?—It depends upon the length of the shaft.

17,526. (*Chairman.*) How are the stemples fastened?—The stemple is put into the hard side, and it is driven tight.

(B^{n}.) MODE OF ACCESS AND EGRESS.

(B^{n}.) Stemples.

17,527. Do not they sometimes come out?—Never as long as they are sound.

17,528. But if the wood decays they will?—If the wood decays we employ wood men to look after the way-gates, and they are repaired: one is knocked out when it is worn by the men or boys' feet, and they put in a new one.

17,529. You have men specially to look after the way-gates?—Yes, six to look after the Old Gang way-gates.

17,530. Do you use much timber?—We use timber in the workings, but not so much in the main levels; we wall and arch the main levels.

Mr. Thomas Raw, Surrender Mine.

17,629. (*Chairman.*) How do the men go into the mine; do they go by the level or by the shaft?—Both ways. The men who descend by the shaft work in the upper part of the ground, and they put their work down in hoppers to the level, and ascend back out of the shaft when they return home.

17,630. They go down the shaft by stemples?—Yes.

17,631. Is the shaft used for drawing or anything besides?—No; it was formerly, but is not now; it is now just used as a way-gate and for ventilation; we keep it open for that purpose.

17,632. From your experience should you prefer stemples or ladders?—I think stemples are as well. I believe that men will climb as easily on stemples as on ladders; they are not so contracted.

17,633. How do the boys manage the stemples?—When they become 16 or 18 and sufficiently strong they do it tolerably well, but the father takes care that he is in front of his son, or if he allows him to go in front he attaches a rope to him, so that if anything happens to the boy and he gets a slip, or anything of that kind, he has hold of him.

17,634. He ties the rope round the boy and round himself?—Yes; he does for the safety of the boy.

17,635. Have you ever had an accident?—We have had two accidents in that shaft since I became agent.

17,636. Were those from slipping?—Slipping in the shaft. One was a young man over 20, his feet slipped and he was killed; the other was a little boy, his father was with him, and he slipped and he lost his life by it.

17,637. Is it not sollered in any way?—We have half buntings, as we call them; half the climbing way is covered over with planks, so that a person slipping or falling might catch upon them and be prevented from going further.

17,638. Have you any men specially employed to look after the way-gates?—Three men are regularly employed (what we call our way-gate repairers) to keep the shaft and all the principal way-gates in proper condition for the men to pass.

17,639. Do they report to you at all upon the state of them?—I inspect them.

17,640. Do they report to you, or do they on their own responsibility repair them?—I direct them where to go to improve and repair if a place is getting wrong and dilapidated.

17,641. (*Mr. Kendall.*) If they saw any weak point would they at once repair it without speaking to you?—Yes.

17,642. They have no entry book?—No; we keep no entry book.

Mr. Reuben Atkinson, Arkindale Mine.

17,761. (*Chairman.*) Would you rather climb up stemples or ladders?—Stemples.

17,762. It is more exertion to come up stemples, is it not?—I do not know that it is.

17,763. Have you ever tried the ladders?—Yes, we tried ladders in mines which I wrought; one place was at what we call Washer Green Level, but I did not like it at all, it was too perpendicular.

17,764. You think that if ladders were put in the men would prefer the stemples to the ladders?—Yes, I believe that they would. We have had ladders, and the men would as soon have stemples as the ladders.

17,765. (*Mr. Leveson Gower.*) Did they give over the ladders?—No; in some places they had not been put in at all. There is only one place where they have been put in, and they never complained between the stemples and the ladders; it never made any difference. I like the stemples quite as well as ladders myself.

Mr. William Barron, Craven Moor Mine.

18,273. (*Sir Philip Egerton.*) As to the difference of expense between ladders and stemples, which do you suppose are the most costly to put up?—I should think that ladders in a permanent shaft would be considerably cheaper.

18,274. Do you think that they are safer than stemples?—Yes, a long way; I am confident of it.

18,275. (*Mr. Kendall.*) Have you ever been in a mine where stemples had been used, and where they had been done away with and ladders introduced?—In all the permanent roads (and I have been a miner since I was seven years of age) there have been ladders; but in little temporary roads which are wanted only for a few months you merely put in a few stemples, because it is not worth while to put in ladders.

18,276. (*Sir Philip Egerton.*) You mean in the rises where you want them for access?—Yes.

18,277. (*Mr. Leveson Gower.*) Do you ever use stemples in those cases?—Yes; sometimes we put in a ladder, if it is likely to be a permanent road.

Mr. Benjamin Calvert, Nedderdale Mining Company.

18,324. (*Chairman.*) Have you ladders or stemples?—We have only stemples at present.

18,325. Have you worked in mines where there were ladders?—Yes.

18,326. Which do you prefer?—I prefer ladders.

18,327. Do you think that the men generally prefer stemples or ladders?—A good many of the men prefer stemples; I do not. As an agent I prefer ladders.

18,328. Did you begin to work with ladders or with stemples?—Stemples.

18,329. And when you had to work with ladders, did you object?—I did not much like them at first.

18,330. And after a time, having tried the ladders, you preferred them to the stemples?—I prefer them decidedly.

18,331. (*Mr. Holland.*) How long was it before you got to like the ladders?—In a few weeks. They are safer.

18,332. (*Mr. Leveson Gower.*) Why do you not put up ladders yourself now?—I believe that we shall; but two parts out of three is what we call a slant rise, and there is only about 12 fathoms plum, and I think that we shall put in ladders after we have got it complete; but we have some water to take off at present. To make the thing more complete, I should recommend ladders into any place.

Mr. Joseph Broad Champion, Merryfield Mine.

18,389. (*Chairman.*) Do the men all go in by the levels?—Some go in by the levels and some go down by a ladder.

18,390. Have you ladders or stemples?—Ladders.

18,391. Do the men prefer the ladders to the stemples?—Yes.

18,392. Have you no stemples in any part?—We have no stemples.

Mr. Henry Daykin, Grassington Mine.

18,438. (*Chairman.*) Do the men enter the workings by the level, or do they go down by ladders or stemples?—By ladders, in our mines.

12,439. In some parts of the rises is it by stemples?—Underground some of the rises have stemples and some of them have ladders.

18,440. Do you go down sometimes by windlass?—Not much; perhaps we do while we are sinking, but afterwards we generally put ladders down.

18,441. Which do you think best, stemples or ladders?—I should say ladders.

18,442. (*Mr. Holland.*) Is there any doubt of that?—No, there is no doubt of it in my own mind. I have been used to both, but I should prefer ladders myself.

18,443. Why?—Both for speed and for safety too.

18,444. And ease of climbing?—You can make it easy both in climbing ladders and stemples too, it depends upon the speed.

Mr. William Craig, Wensleydale Mining Company.

18,526. (*Mr. Leveson Gower.*) Do you use stemples or ladders?—Generally ladders.

18,527. A witness from Swaledale told us that stemples were more economical to put up than ladders, because the stemples were used for supporting the side of the shaft; do you know any mines in which you think that that would be the case?—Yes; I have been in several mines where they climb by these stemples, and by the same timber which supports the shaft; but I decidedly think that it is better to have ladders.

Mr. Thomas Job, Hebden Moor Mine.

19,559. (*Chairman.*) Have you been in mines where the stemples were used?—Yes, in Derbyshire.

(B f^{n}.) *Day or Adit Levels.*

(B^{n}.) MODE OF ACCESS AND EGRESS.

18,550. To what depth of shafts?—I have seen stemples there 24 or 25 fathoms in depth.

18,561. Which do you think are preferable, stemples or ladders?—Ladders.

18,562. You have no doubt of it?—Not at all; they are more easy for climbing, and there is greater safety as well.

(f^{n}) DAY OR ADIT LEVELS.

Mr. WILLIAM PHILLIPS, Greenside Mine.

13,896. (*Chairman.*) How do the men go down underground?—They enter the mines by going into a level or tunnel.

13,897. Are there any shafts in the mine?—There is one.

83,898. How many levels are there?—There are six.

13,899. Does the shaft communicate with the lowest level?—Yes.

13,900. Is the shaft used as a drawing shaft?—Yes.

13,901. Is it used also as a ventilating shaft?—Yes.

13,902. Is it an up-cast or a down-cast shaft?—It is a down-cast shaft.

13,903. Is that high up the level?—No, it is sunk in the bottom of the low level; about 400 fathoms from the entrance.

13,904. How many levels are there above the shaft in the side of the hill?—There are five.

13,905. Are the mines all worked by levels from the day?—Yes.

13,906. Do the levels communicate with each other by winzes?—Yes; they communicate with each other by winzes and stopes, or headings, and roofing, as they term it here.

13,907. Is there much water in the mine?—Not much, about 1,000 gallons in every 24 hours.

13,908. Which is the wettest level?—The bottom or the deepest; the 36-fathom level, sunk from the present Low Horse Level.

13,930. From what depth have they to climb the ladders? Scarcely any at all; there are no ladders; it is all worked away by stopes.

13,931. There is nothing then to prevent the old men from performing their work?—No; they can walk right to it.

13,932. How far have you ever driven any of these drifts from the day or from the shaft?—The low horse level is about a mile driven from the entrance.

13,936. What is the greatest distance that you have ever driven a drift from the day without being a through drift? Three hundred fathoms. We use a blast generally for such levels; about 300 fathoms we use a waterfall.

Mr. TINNISWOOD MILLICAN.

14,191. (*Chairman.*) Do the men enter all these mines from the Horse level, or do any enter from the shaft?—Some enter from the shaft.

14,199. How do you enter it?—We enter it by the level; the underground level.

14,207. The men enter by the driving ways into the mine?—Yes.

14,208. For what number of fathoms is the drift carried?—About a mile, as near as I can tell you, in this mine where the workings are.

14,209. In that distance are there any shafts going to the surface?—Yes; there are two shafts, and several rises from the low level, and some from the high level for circulation, &c.

14,210. At the end of the mine is it opened up into another working?—Into another level communicating with the foremost shaft.

14,211. Is there no special ventilation in that distance? Several communications, as stated above.

14,212. Do the men go in waggons to their work?—Generally.

14,213. Are there waggons employed to take their tools in?—Some of the men ride in waggons along with the tools occasionally, and the others push forward the waggons.

14,214. You say that that is not general throughout the country?—It is not so.

14,215. Where it is not so the men have to carry their tools?—Yes.

14,216. When you are getting to the end of a level do you drive below or above this horse level?—We generally work above the horse level, and we still aim at getting our horse level in as low as we can, we find that of advantage, it answers as a drain, and the work comes better and cheaper.

(B f^{n}.) *Day or Adit Levels.*

14,227. Do the men descend into the mines by means of cages?—No, we have none, we have very little of that kind of work now; what we call shafts or sumpts; formerly this country was wrought a great deal in that way in winzes and shafts; we find it a great advantage if we can get a level in, it answers for a drain.

14,228. When you are inside you must have winzes or shafts to get at a lower or higher level?—Occasionally, but very little.

14,229. Suppose that a vein extends upwards, how do you reach it?—Then we rise up.

14,230. By ladders?—Yes.

Mr. THOMAS WILSON CRAWHALL, Rodderup Fell Mine.

14,562. (*Chairman.*) Have the men any climbing from one level to another; how do they go from one level to another?—They do not require it unless for their own objects; there are frequent communications between these two levels, but we have no one working in the middle level; if they like it they can go in by the middle level and descend by ladders, it is by ladders entirely.

14,563. What is the greatest depth from one level to another?—30 fathoms, but nearly all of them go in at the low level, and then they have simply to climb up to their place of working, which may be close to the level, or they may have to climb up nearly the 30 fathoms if we have got out nearly to that point.

14,643. Do the men take their tools in waggons into the mine, or do they carry them in?—They partly carry them in, and they partly go in by waggons.

14,644. They have to carry them in sometimes?—Occasionally.

14,645. That is a long distance?—Yes, it is a considerable distance.

14,646. What is the longest distance at either of the mines?—At Rodderup Fell, if they carried them into the west end, it would be nearly a mile.

Mr. JOSEPH RODAM, Bentyfield Mine.

14,808. (*Chairman.*) What is the extreme length of any level driven from the day?—I should think about 800 fathoms.

14,809. Is there any shaft communicating with it?—It is driven until it is communicated with another level which comes in from the day.

14,810. So that there is a thorough ventilation?—Yes, a regular ventilation through.

14,811. Is that an air level?—It answers two purposes, an air level and taking out work.

14,812. Are you now working below that level or above that level?—About the level.

14,813. Are there any shafts to the surface?—Yes, but we have some of them closed on account of carrying the current of air forward.

Mr. JOSIAH REMFRY, the Derwent Mine.

14,843. (*Chairman.*) About how far is any one level driven from the day?—The level probably is 300 fathoms in length; I should say about that.

14,844. Is there more than one shaft sank from the level?—Yes; in the level that I speak of, namely, in the eastern part, there are several shafts, which, if you saw the section, you would see at one view. (*The witness produced the same, and explained it to the Commissioners.*)

Mr. THOMAS WARE, Stone Croft and Grey Side Mines.

15,296. (*Chairman.*) How do they enter the mine?—At the adit level.

15,296. How deep is the mine below the adit level?—About 30 fathoms, that is our deepest working.

15,297. What is the length of the longest level?—Our longest level is about 400 fathoms.

15,298. Are there shafts from that level to the surface?—There are two main shafts.

15,299. How far below that longest level are you working?—About 14 fathoms.

15,300. About how many levels are there?—We have four levels.

15,301. Are they all working now?—No, we only work two of them.

15,302. Are they the two lowest ones?—Yes.

15,303. How many men are working in the longest level?—About half of them, between 20 or 30.

15,304. How do the miners go down, by ladders?—Yes, and they come up by climbing.

15,305. From the adit level?—Yes.

) Day'
t Levels.

(B^{a}.) MODE OF ACCESS AND EGRESS.

(B f^{a}.) Day or Adit Levels.

Mr. John Ridley, Coalcleugh Mine.

15,459. (*Chairman.*) How do they go underground; by the adit level?—Yes, they have what they call waggonettes, and they ride along on those and take their working tools with them.

15,460. (*Mr. Austin Bruce.*) How far do they go generally?—From a mile to two miles.

15,461. (*Chairman.*) Are there shafts communicating with that horse level?—Yes.

15,462. About how many?—That is rather a difficult question to answer. I have a short report here, which is something like a general outline (*producing the same*). There are so many shafts that it is difficult to count them; it cannot be done; and there are communications between the different levels, what we call rises and sumpts.

15,453. You cannot say how many direct shafts there are from the surface?—No.

15,464. But there are several shafts?—Yes. There are not so many shafts from the surface as there are below it communicating with the different levels.

15,465. What is the greatest depth below the level at which the men enter?—The works are all above this level where the men generally enter.

15,466. How do the men go to the higher levels?—By means of what they call rises and sumpts; by ladders.

15,583. (*Mr. Davey.*) How far have you driven the deepest level from the day?—About two miles.

15,584. That is principally arched by stone, is it not?—A good deal of this level is arched, but there is not any stone or wood in the greatest part of it at all.

15,585. In arching that ground do you carry an air-drift above it?—No.

Robert Walton Bainbridge, Esq., Teesdale and Alston Moor Mines, &c.

16,156. (*Chairman.*) Are the mines entered by a shaft, or by a horse level?—By horse levels generally; indeed, I think I may say almost exclusively.

16,157. What is the longest horse level in which you are working?—Some 400 or 500 fathoms; longer when you take the line of the level in the course of the vein. In driving the adit from the valley, we reach a number of objects on the road; and in each of those objects we drive a branch level when reached.

16,158. Are there many adits driven for the purpose of ventilation alone?—Yes; in order to effect an opening to a pre-existing level or shaft, I may say, generally, that when we set on a level it is seldom for the purpose of covering only one object; we, generally speaking, know of the existence of a number of veins before us, and on our reaching the first vein, if it be of sufficient magnitude and of a fair mineral character, then we rise to the surface, not only for ventilation, but for proving the character of the vein in all the strata between the level and the surface; we follow up the vein according to the course of the lode.

16,159. Do you then work it as a rise, or do you put in another level?—We rise, in the first instance, to the surface for ventilation, and after we have done that, then we drive in the course of the vein at the same random as the original level, and into that level we put a horse and waggons always. Suppose we find, in the course of our rise, in the different strata through which we have passed, ore yielding indications, then we put on, from the rise, drifts in the course of the vein; and between such drift and the horse level, and also the surface, frequent communications are made for ventilation and other purposes. As each vein is reached a like procedure takes place. Generally speaking in mining we find some of the strata ore-yielding and some not; as a general rule, it may be said that the plate beds are not ore-yielding; there are exceptions.

16,160. Is it limestone generally?—We have alternating beds, both of limestone and sandstone.

16,165. How do the miners enter the mines, and how do they come out?—By the horse level, although that depends upon the convenience of their own residences. Some of the men may have, from their own residences, to come out over the summit of the hill, and in that case they go down shafts.

Mr. Joseph Pattinson, Little Eggleshope Mine.

16,913. (*Chairman.*) What is about the extreme length of any level which you are driving from the day?—530 fathoms, I think.

16,914. And you are driving now to form a communication with the mine on this side of the hill?—We have a communication already by means of a rise between the two levels, that is to say, the west end of our Little Eggleshope mine and the east end of this (Wire Gill) mine have a communication between the two levels.

16,915. Your men are now driving to form another communication, are they not—Yes, at a lower level.

16,196. How far have you driven that from any communication with the surface?—In opening up the vein to the extent of 530 fathoms, I believe that in those 530 fathoms we have 13 shafts communicating with the surface.

16,917. How far are you driving from any communication with the surface that level which is to meet the other?—I would say 40 fathoms.

Mr. Francis Taylor, Old Gang Mine.

17,514. (*Chairman.*) What is the length of the lowest level?—The level that we were in yesterday is the longest that we have; that would be within about 170 fathoms of the far end, where it communicates with another level which comes up from the other side of the hill.

17,515. Do you know how long it is?—Not exactly, but I think that it is a mile and a half.

Mr. George A. Robinson, Grinton Moor Mine, &c.

17,790. (*Chairman.*) You consider it a great advantage to work the mines by means of the horse levels?—Yes, compared with any other system it is better in every way, both for the health of the men and for ventilation, and for convenience of working and safety as well.

17,791. And economy in getting rid of the water?—Yes, that is where we have the great advantage. We also find the advantage of levels in the supply of water for dressing the ore and for the smelt mills.

17,792. The level gets rid of the water, and turns it to the use of the mill?—Yes.

Ventila.

(C^{a}.) VENTILATION.

(C^{a}.) Ventilation.

Mr. John Barratt, Coniston Mines.

13,408. (*Mr. Austin Bruce.*) Is there some kind of stratification which drains out the water?—No, it is the closeness of the rock. In the very bottom it is very hot, but as soon as a draught is made the agent says that the air is as good in the 150 as it is elsewhere.

13,409. How can be judge?—From the coldness of the air. We are obliged to put in doors to stop the current, because it is so strong.

13,410. Do you carry that air into the parts of the level where it is hot?—Yes, if it is required

13,411. Is there any place where the candles have not burned well?—No, except in the level perhaps.

13,412. Have the miners ever to slope the candles?—No, very rarely; they may in a level when they have advanced beyond a winze or a sumpt. When they have advanced 20 or 30 fathoms the air becomes close.

13,413. (*Mr. Holland.*) Is it not so close as to oblige the miners to slope their candles?—Yes, in that case they would perhaps.

13,414. (*Chairman.*) How far should you say you could drive a level from a winze or a shaft?—At Tilherthwaite, that is now 500 fathoms from the main level and no communication. It is going on now with six men.

13,415. (*Mr. Kendall.*) How do you manage to send the air in?—By a water blast through a 6-inch iron pipe. We drive the air in for a distance of 500 fathoms. I was there not long since, and it would almost blow a candle out.

13,416. What is the height of the waterfall?—About 30 or 35 feet.

13,417. (*Mr. Holland.*) Does the water fall in a jet?—Yes: the water falls into a cistern, and a pipe is carried on horizontally.

13,418. (*Chairman.*) It is carried on for 500 fathoms?—Yes.

13,419. What is the longest time during which a miner can work in air where the candle will not burn well?—They do not work above six or seven hours.

13,420. How many weeks or months do you think they

(C^{n}.) VENTILATION.

could continue to do so?—We never saw any effects produced by it.

13,421. How long would they continue to drive that level where the air was so bad that a candle would not burn?—The candle will always burn, but it is necessary to put it a little on one side. We have no such instance as that now, but I have seen it.

13,422. How long do you think a miner could keep on working in that state of things?—For six or eight hours.

13,423. Do you think he could continue to work under such circumstances for many weeks or months?—For months or years. If a man does not like a place he will not take it, and another will come and take it; there is no compulsion used here.

13,424. You say that the miners sometimes refuse to take a place?—Yes, they say that they do not like it, and they will not take it.

13,425. (*Mr. Holland.*) Do they refuse to take it because the air is close?—Partly on that account; but there is not an instance of that now. We have not an instance in the mine at the present time where the air is so close as that.

13,426. (*Mr. Austin Bruce.*) To what do you attribute that fact?—To the communications, the winzes, and the shafts. We never care about the distance to the shafts, but we put winzes through at certain points, and then a rush of air comes to the winze, and then the level advances on.

13,427. (*Chairman.*) Is there one of these shafts which is always an up-cast shaft?—Yes, generally so, in the western part of the mine, for there it is the higher ground.

13,428. (*Mr. Holland.*) Does the air never go down that shaft?—Yes, occasionally it does.

13,429. (*Chairman.*) Is it not at all affected by the weather?—I do not know that it is. We have met with instances in which the current was not so slack, or too strong, and we have put a trap door in, the level of the mountain being 50 or 60 fathoms higher than the downcast shaft.

13,430. You have put trap-doors in?—Yes, in many places to check the current, because the men have complained of being cold.

13,431. You put trap-doors in to check the current, and not to send the air into any other place?—Yes; there is too much air unfortunately.

13,432. After blasting, how long is it before the powder smoke is cleared away?—It goes away directly, or very soon; but that depends upon whether it is a close air; if it is, then the powder smoke lies longer than at other times.

13,433. (*Mr Holland.*) What should you say was the longest time that the powder smoke hangs about?—I have no idea; but perhaps 10 minutes or a quarter of an hour.

13,434. Is that considered a long time for the powder smoke to hang about?—I do not know, we do not attend to that, we experience no ill effects from it. If I go underground the men will say to me, You had better wait a quarter of an hour.

13,435. Does it ever hang about so long as an hour?—No.

13,436. Never?—No.

13,492. Are these mines, in your opinion quite free from dust?—Yes.

13,493. Are they very free from powder smoke?—Yes, very much so, although our consumption of powder is considerable.

13,494. Are your mines cooler than the Cornwall mines?—Yes, they are cooler; for example, we have to put in trap-doors to diminish the draught.

13,495. Is that to increase the comfort of the men or for the purpose of saving candles?—It is done for both purposes.

13,496. For which purpose chiefly is it done?—I should say for both.

13,502. (*Mr. Austin Bruce.*) You have stated that your upcast shaft is always the same?—I think it is generally so.

13,503. Does not that depend entirely upon its being higher than the downcast?—I presume so.

13,504. Supposing that it were not so, and that you had not that natural advantage, should you take any trouble so to guide the air as to make the up-cast shaft always up-cast?—I do not know; we have never had an instance to require it, and I do not see how it could be done, except by stopping up the upper parts of the mine to the west of the high ground. The natural cast is up-cast.

13,505. You have so much ventilation that you have no difficulty in supplying every portion of your mines?—That is so.

Mr. WILLIAM MITCHELL, Coniston Mines.

13,517. (*Chairman.*) Are you a Cornish man?—Yes.

13,518. Have you worked in any mines in Cornwall?—Yes. I was brought up from a boy as a miner.

13,519. Did you ever work in any mines in Cornwall in any poor air?—Yes. I have worked in poor air in mines, but not much.

13,520. Did you suffer at all from working in poor air?—Yes. I suffered from head ache, and weariness and languidness after it.

13,521. How did you discover that you were working in poor air?—By the difficulty I felt in breathing. I felt a difficulty, and also from the candles not burning (or burning dimly).

13,522. Have you ever seen any place in the mine in which you are engaged where the candles would not burn?—No.

13,523. Are there any doors in this mine?—Yes, we use what we call trap-doors.

13,524. Could not they be used in Cornish mines with advantage?—Yes. They might be used more than they are from what I have seen of mining generally.

13,525. You think that the trap-doors could be advantageously used for the purpose of disseminating currents of air?—Yes; and much better than at present. Oftentimes in mines where there is water that water might be used for throwing the air into the levels when they are exploring the mines.

13,526. Have you ever used a water-blast?—Yes; we use a water-blast in these mines, and we throw in the air now for 500 fathoms.

13,527. That is in the mine called Tilberthwaite, is it not?—Yes.

13,528. Not in the Coniston mine?—No, we have no occasion there.

13,529. Is there no place in your deep mine where there is bad air?—No.

13,545. (*Mr. Davey.*) You have stated that you had found some foul air in a mine in Cornwall?—Yes.

13,546. You also stated that there are many places in which they might improve the state of the air by waterfalls?—Yes, by water-blasts and trap-doors.

13,547. Can you give me any instance of a mine in which you found that state of things to exist?—At Par Consols and Fowey Consols, where I was brought up, and at South Caradon. I have worked in that as a tributer.

13,548. Do you know whether those matters had been represented to the agent?—I do not know whether they had been altogether, but it is connected with a little expense; if it was enforced it might ultimately be beneficial to the men, and I believe also ultimately to the employers.

13,549. Are you expressing merely your own opinion or the opinion of the agent?—It is just my own simple opinion, judging from experience.

13,555. (*Mr. Kendall.*) Have you ever seen a case of close air in any mine which might not be remedied by a small outlay and a little skill?—No; in every case that I have seen it might have been remedied.

13,556. It is a mere matter of expense, is it not?—Yes.

13,557. (*Mr. Austin Bruce.*) You have just answered a question with reference to close ends, do you believe that the air is so well distributed over the mines in Cornwall to which you have referred as it is over these mines at Coniston?—I think not.

13,558. You think it is not so well distributed generally throughout the works?—The mines in Cornwall are not so well ventilated as our mines are.

13,559. In what do you think the superiority of these mines with regard to ventilation consists?—It is by using trap-doors and pipes more than they do in Cornwall.

13,560. By trap-doors do you mean for distributing the air, or pipes to bring in fresh air?—Yes.

13,561. Are the trap-doors used for checking the air, or for distributing it?—They are used to divert the air from one channel into another where it is wanted.

13,562. So that every portion of the mine gets its proper supply of air?—Yes.

13,563. Do you take any precautions against the leakage of the air before it gets down into the deeper parts of the mine?—We have got a natural downcast and an upcast in the deep mine; we have a shaft at each extremity, one is downcast and the other upcast; and then, whenever the air is wanted to be directed to any place, we use these trap-doors in order to direct the air to those places where it is most wanted.

13,564. Could you do that as effectively if you had not a natural upcast and a natural downcast?—No.

13,565. Supposing you had not a natural upcast and

Ventila-

downcast, should you consider it worth while to make them by artificial means?—Yes.

13,566. Do you think that the ventilation can be complete without an upcast and a downcast?—No.

13,587. (*Mr. Kendall.*) Have you not an advantage over the Cornish mines in your copper mines here by having such great backs to your adits?—Yes.

13,588. And that conduces more to the health of the men?—Yes.

13,589. Is your upcast shaft always an upcast shaft?—No, not always, which is owing partly to the state of the atmosphere, whether it be light or heavy above; sometimes it is one and sometimes the other. It does not vary in the summer, but it may vary in gusty weather and in strong winds.

13,590. Generally speaking you have a regular up-cast shaft, but there are seasons when it changes?—Yes, and is just the reverse.

13,591. Is your up-cast shaft an old one or a modern one?—The up-cast shaft is what they call a new shaft.

13,592. Have you any communications by workings immediately into that shaft at the different levels?—Yes.

13,593. Is not that merely as a chimney?—It is a level driven from one shaft to the other shaft.

13,594. At what depth is that level?—At the 130 fathoms.

13,595. From that 130 fathoms to the adit level have you any other communication with that shaft?—Yes, there are levels at every 20 fathoms.

13,596. Do they run into that shaft?—Yes; yet still it is an up-cast shaft. We have doors to the shaft. The shaft is wooded at the openings of the levels. We use doors that we close.

Mr. Benjamin Plummer, Goldscope Mine, &c.

13,664. (*Mr Kendall.*) What is the greatest length of any drifts in your mines?—The greatest length of any drifts that we have from day will be 450 fathoms. The first level was driven 200 fathoms before the lead was cut, and at that point we sunk a shaft, and that shaft communicates with the surface. We driven south of that shaft 250 fathoms; consequently the level from there would be 450 fathoms long. We have only one shaft, but we have small winzes to effect ventilation, and for the miners to go up and down.

13,665. What means of ventilation have you employed?—We have used the ventilating fan with zinc pipes 4 inches in diameter.

13,666. How is that ventilating fan worked?—It is worked by a small water-wheel, and the speed is multiplied very much to force the air in.

13,667. In what part of the mine is that applied?—We take the air from the shaft, and force it up through those pipes from the shaft that is carried out to day. We take it from that point, and it is perfectly pure there.

13,668. Does the water that works this wheel fall down the shaft?—It is brought down in boxes through the shaft, and then brought out through the first level that I have described.

13,669. At the bottom of the shaft it drives a wheel?—Yes, a very small water-wheel, and that water-wheel carries a fan blast.

13,670. Does the shaft go down below the day level?—Yes, 72 fathoms; the wheel that works the fan is fixed in the adit level.

13,671. Is the fan constantly at work?—Yes.

13,672. And do you find that perfect ventilation is effected by that means?—Sometimes, when the atmosphere is not very clear we find that the air is bad after that even, but there are times when we get a brisk wind outside, and a clear atmosphere that we get very good air; for instance to-day, when there is no wind, and the weather foggy, the smoke would lie and be very black in the fore-end.

13,673. Would the candles burn well?—Yes; it is only the smoke; you find a choking sensation, and it is very disagreeable to breathe.

13,674. By what means does the foul air escape?—It is driven back through that level, a pipe is conveying up the pure air, and that being heavier than the impure, it is driving it away.

13,675. Does not the impure air find its way up the shaft at all, the return air and the smoke?—Yes.

13,676. Is there not a danger of its being blown back again at the point where you have a fan?—No, I do not think there is.

13,677. (*Mr. Holland.*) What prevents the fan from fanning in the return air?—Where the fan is fixed the air is as good as it is here, nearly, under ordinary circumstances, when the atmosphere is clear, and it is nice weather; but if there is a little impure air mixing with it, it is not felt. There is generally a strong current where the fan is working.

(Cn.) *Ventilation.*

13,678. (*Chairman.*) On such a day as this, how long are the men obliged to refrain from working after they have blasted a hole?—From 10 minutes to a quarter of an hour.

13,679. Are they ever obliged to cease work altogether?—No.

13,680. Will the candles always burn well?—Yes.

13,681. Where do the men go during the 10 minutes or a quarter of an hour after they have blasted a hole?—They go back into the level before the smoke gets back to them; they go back to a point where it is dry and sit down, and perhaps get their meat, or smoke their pipes, till the smoke is driven out of the fore-end? and when it reaches them it has left their working place.

13,682. (*Mr. Kendall.*) Then they are obliged to pass through that smoke before they can get into pure air again?—Yes, they must breathe it as they pass through it.

13,727. (*Mr. A. Bruce.*) Do you carry air up into all these places?—No; at Goldscope the mine is naturally ventilated, first we sink an engine shaft 10 fathoms, say from the 60-fathom level to the 70 fathoms, and at the time we are doing that we have two companies of men, each of them at 10 or 12 fathoms, or at the most feasible point from the shaft, sinking winzes, and when they are down to the 70-fathom level and the shaft is down to the 70-fathom level, we drive from the shaft out and effect a communication with the bottom of those winzes.

13,728. You have stated that the main difference in the supply of air below arose from the dulness of the atmosphere above?—Yes.

13,729. Is there any cause besides the dulness of the atmosphere and the powder smoke which effects the air below?—I do not know of any; I do not see how there can be; to-day it is a dull day, and we should find the air or the smoke lie heavy and black and worse to breathe; when we find that the atmosphere is dull outside we attribute to it all foulness; if to-morrow we find that the air is poor inside, we say that the atmosphere is the cause of it.

13,730. Are you aware whether there any gases or vapours proceeding from the mine which affect the air?—I should think not, not in the strata that we are passing through.

13,755. (*Mr. Holland.*) Are the miners much annoyed by the powder smoke?—No; if the air is pure the powder smoke does not injure them much. I have never considered powder smoke of much annoyance if the air is pure.

13,756. If you were to reverse the working of your fan so as to draw the air out instead of forcing it in, the men would not have to pass through the powder smoke?—That is true, but I never saw it done.

13,757. Do you not think it would be an improvement?—I do not know.

13,758. Do you see any practical objection to doing that, just to turn the fan round and make it draw the air out instead of forcing it in?—The fan would not draw; work the fan which way you would it would force.

13,759. Are you not aware that you may make it draw as well as force?—Not a fan; I have proved it; I have reversed it and turned it all ways, but it always forces; our fan will not do it otherwise.

Mr. James Postlethwaite, Keswick Mines.

13,818. (*Chairman.*) How do you ventilate your mine?—By shafts and levels both; we have a main shaft, and then we take levels from it at every 10 fathoms in height; for instance, we have a level 20 fathoms deep, another 30, another 40, and another 50, there are only 10 fathoms between those levels, and at the distance of about 15 fathoms in length we put a hole through between those levels, for the purpose of ventilation.

13,819. (*Mr. Holland.*) Going to up the surface?—Yes, but not in a direct line.

13,820. (*Chairman.*) It is not the whole way to the surface, is it?—The highest level is ventilated to the surface, the next in depth is ventilated "by rises" into one above it, and so on to the lowest level, but these rises are not always at the same point, consequently not always in a direct line.

13,821. You said that you had one air shaft?—Yes, but they all serve as air shafts.

13,822. Are they up-cast or down-cast shafts?—They are both.

13,823. (*Mr. Holland.*) Does the air always go in the same direction?—No.

13,824. (*Chairman.*) It changes according to the weather?—Yes, and according to which way the wind blows; we are in a hill.

13,825. There is no one particular shaft which is always up-cast?—The engine shaft, the large shaft, is always up.

13,826. Does that stand on a higher level than the others?—It is not the highest, it is the largest shaft.

13,827. Why do you suppose that it is always up-cast?—I should fancy that the pumps have something to do with it, but chiefly because it is the deepest shaft in a straight line.

13,828. The pumps keep the air in motion?—Yes; I never recollect seeing it down-cast in the engine shaft, but the others change.

13,834. (*Mr. Davey.*) Do you ever find any difficulty before you communicate these winzes from one level to another?—Yes; that is where we have our difficulty.

13,835. How do you remedy that?—We never go so far but what we can manage it without artificial means. We have a difficulty, but we get through the difficulty; we put fewer men; for instance, if I have four men working at the end of the level and I put four more men to rise a winze through, probably before I get that winze through, they have not sufficient air, and I am obliged to reduce the men one half, and to leave the place during the nights.

13,836. Do you use any artificial means of forcing in air?—Yes; I have had both a little fan blast and a blast caused by water and taking pipes along the level.

13,837. Could not you force in sufficient air to allow you to work the whole of the time?—Yes, we can do so, but we do not like artificial ventilation, we would rather have it natural.

13,838. Would it not be better to use artificial means than to punish the poor man by working in poor air?—Yes; but that punishment, if it is punishment, is of short duration; we can easily work from the last rise, 15 fathoms, and the little difficulty is before we get the rise quite through, probably in the last month, so that all this outlay and expense in providing artificial ventilation would only be for the month.

13,839. Would it not be more economical for the adventurers to use that trifling expense than to reduce the force in these levels?—No, not in lead mining; we have a need to make these rises or winzes as explorations; we consider that we never ought to go beyond the 10 or 15 fathoms upon a vein provided it is dead without making these openings between one level and the other, for fear we should pass over the lead.

13,840. What is the width of the vein?—It varies from six feet to one foot

13,841. As to its richness, does it vary?—It is very irregular.

13,873. (*Mr. Holland.*) You have spoken of a pain in the head produced by bad air; is that common?—Yes. While you are in the place it affects you with a pain in the head.

13,874. Does that air affect the candles much?—Yes; they will scarcely burn; we have to place them horizontally.

13,875. Is it a common thing for you to slope the candles?—No.

13,876. Is it very uncommon?—Yes; something is very far wrong if we have to do it.

13,877. Does the powder smoke hang long with you?—No. The men retire back after blasting, and they will stay ten minutes or a quarter of an hour, and when they go back most of the smoke has gone away.

13,878. Is it very uncommon for them to stay more than a quarter of an hour?—Yes. I do not know any place in our mine where it is necessary to stay longer than that.

13,879. Do you speak of mines generally in this neighbourhood?—Yes; I am acquainted with most of the mines in this neighbourhod.

13,880. Would it be considered very bad if they stopped half an hour or an hour?—Yes, decidedly.

13,881. It does occasionally happen?—I have seen places where it is scarcely ever entirely clear, but a little smoke is not always an indication of bad air.

13,882. But the stopping is not to such an extent as that they cannot work?—It is very uncommon for them to have to stop more than a quarter of an hour.

13,883. Do you think it more economical to reduce the speed of the work than to introduce artificial ventilation?—Yes.

13,884. What is about the cost of putting up a fan and a pipe of 20 fathoms long?—20*l.* perhaps. There is a long length of pipe to take.

13,885. It would cost very little to shift that from one level to another?—You would have to shift it, and to lay the piping again.

13,886. That would not cost much, would it? About what would it cost to shift it from one level to another?—I could not say less than 10*l.*, and I do not know that I could do it for that.

13,887. Can the men work with equal effect in such air?—I have never seen artificial ventilation so efficacious and complete as that procured by rises and winzes from one level to another.

Mr. WILLIAM PHILLIPS, Greenside Mine.

13,936. (*Chairman.*) What is the greatest distance that you have ever driven a drift from the day without being a through drift?—Three hundred fathoms. We use a blast generally for such levels; about 300 fathoms we use a waterfall.

13,937. How do you ventilate it?—By a waterfall; the pipes are cast-iron pipes of five inch bore, six feet long, each with spigot and faucet joints.

13,938. Are those carried to the end?—Yes.

13,939. How near are they carried to where the men are driving?—Sometimes within nine feet; but it depends upon circumstances; sometimes they are perhaps three or four fathoms behind; but generally speaking they are within two or three fathoms.

13,940. Does that give perfect ventilation?—Yes.

13,994. (*Mr. Kendall.*) You have had a good deal of experience in Cornwall and in this district, in your opinion are the miners in Cornwall as healthy as they are here, or not?—They are not so healthy.

13,995. To what do you attribute that difference in the comparative health of the miners?—It is owing to the deepness of the mines and the mines not being so well ventilated.

13,996. In Cornwall they have not the same means for ventilation as you have here?—Of course they have not; they have not the same advantage, that is, not without going to enormous expense, and of course the mines could not be worked, that is a point of calculation.

Mr. JACOB JOHNSON.

14,096. (*Chairman.*) I suppose that at the 60-fathom level the air is quite good?—As fine air as it can be.

14,097. You would not work in air if it were bad?—I am getting to that age now that it would soon kill me. I am now 64 years of age, and that is when it affects people, when they become aged.

14,098. They are more affected then than earlier in life?—Yes. Their nature is gone. They cannot stand it so well as the young men can stand it; the old people cannot.

Mr. TINNISWOOD MILLICAN.

14,231. (*Chairman.*) When you rise up in that way, or sink down, how do you manage for ventilation?—We have hand airing machines, and generally blast pressure down another shaft.

14,232. Will you be good enough to give a description of the water-blast that is used?—The water-blast is a pressure blast with a small hole near the end of the lowest pipe, and we sometimes attach an airing machine to it.

14,233. Which do you think answers the best?—I can scarcely tell; it is a good while since I have seen them much tried. Mr. Watson will give you more particulars about the blast.

14,292. (*Mr. St. Aubyn.*) To what cause have you heard them ascribe their failing condition?—Sometimes the mines are not so good for air as we would like to see them.

14,293. Is there bad ventilation?—Yes, on this account; sometimes when we are holing to a place we have to change the men and not to let it depend altogether on one partnership. We wish to change them and let every person have a share, and in cases of that kind it is unavoidable; as soon as we can get them ventilated we do so.

14,294. That is one cause?—Yes.

14,295. Is there any other cause that you have heard the miners mention?—No; it is the want of ventilation and the dusty places, that is what they complain of; when we happen to have anything of that kind it is unavoidable, there will always be some places of that kind in mining.

14,358. (*Mr. Holland.*) Are any of your mines so badly ventilated that it is difficult to keep a candle burning upright?—I should think they are scarcely so bad as that, but it may be so for a day or two.

Mr. THOMAS WATSON.

14,361. (*Chairman.*) What is the longest distance that any drift has been driven from the day?—I cannot say exactly the distance from the day; we generally call them levels. I should think that the longest is about two miles.

14,362. In which mine would that be?—In Caple Cleugh Mine.

14,363. Does that communicate with any old workings?—Yes, it communicates with the Garrigill mines, and it communicates with the Long Cleugh mine as well.

14,364. In the course of that distance are there shafts going to the surface?—Yes.

14,365. Do you know about how many there are?—There are a great number of them closed now, the old shafts; and the current passes right through the mountain on to the Garrigill side, a distance of fully three miles.

14,366. You say that the shafts from the surface are closed?—Yes, a number of them, but we have about half-a-dozen that are open.

14,367. Do any of these act as up-cast shafts?—Yes.

14,368. Is one constantly an up-cast shaft?—Yes.

14,369. Where is that situated; is it high or low down?—It is just about the summit of the fell; it is the moss shaft.

14,370. That is always an up-cast shaft?—Yes.

14,371. Does the powder smoke always make its escape in that way?—Yes.

14,372. Do you employ any artificial means for making that an up-cast shaft?—No, it is just natural.

14,373. How far have you ever driven from either of these shafts?—It is an old shaft; the fact is that it is just situated about half way down the summit of the fell from the Nenthead side and the Garrigill side; but there have been several openings, and there are openings connected with the old works both on the west and on the east side of that shaft.

14,374. Have you ever driven any level where, when the men have been working, the candle would not burn upright?—Sometimes when a place has yielded a considerable quantity of foul air we have met with it in that way, in the great limestone there are a great many crevices; it sometimes happens when the weather is going to be bad, that out of these crevices the foul air is blown.

14,375. The foul air you think comes out of the crevices?—Yes, I think there is little doubt about that; I think at least that it comes from there, there is no opening from the surface or from any other quarter that we are aware of; it just comes in from some place lodged in the rock; at what distance it may be from where we are working we cannot tell.

14,376. What do you consider to be foul air?—We call it foul or bad air. We commonly use the words foul air for bad air or impure air; but, perhaps, strictly speaking, it is carbonic acid gas that comes out of the limestone

14,377. How do you discover it?—It nips the candle out.

14,378. Do the men feel it before the candle is nipped out?—Yes, they feel a difficulty in breathing, and the candle burns dimly. If the working is not sufficiently impregnated with gas so as to extinguish the light, then in order to test the quantity that is coming into the working they apply a candle to a crevice, and then if it be powerful it at once extinguishes the light as it comes out of the crevice. We have had hundreds of instances of that kind in the great limestone. And there is another thing, what comes out of the crevice always takes the bottom; it flows at the bottom, and the candle is extinguished there when it would burn quite easily at the roof.

14,379. (*Mr. Kendall.*) Will it flow without mingling with the other air?—That depends upon how far it is to the point of ventilation.

14,380. What is the greatest distance, or have you ever noticed that?—Perhaps 100 fathoms in some instances.

14,381. (*Chairman.*) When you find this to be the case do the men leave off their work?—Sometimes they do and sometimes they do not if they think that they can manage; it is just left to their own judgment for the most part; but in many instances when we have gone to view them, and we have found the air to be bad in that way, we have advised them to leave off.

14,382. Although the men were working on?—Yes.

14,383. Do you find that by taking the men off for a certain time the air improves, or do you use any artificial means for the purpose of ventilation?—There is a certain change in the atmosphere when these crevices supply none of this sort of thing into the working; there seems to be a current in a contrary direction, so that it either confines it or takes it away in the other direction.

14,384. The men in that case must wait for a change of weather before they can go back to their work again?—Yes, unless they go back through the level in the same state.

(Cⁿ.) *Ventilation.*

14,385. How long have you ever kept the men idle for this reason?—Very seldom for above a day or two.

14,386. Do you never in such a case apply any means to get rid of this bad air?—Not when it is coming out of the rock in that way. We sometimes apply a more powerful ventilating apparatus. If a place supplies a great deal then we adopt means just according to the circumstances, that is, we set on more ventilating power.

14,387. Do you sometimes find that although there is plenty of air above and the atmosphere is clear, the carbonic acid gas puts the candle out?—Yes. Sometimes when we have had an old sumpt when all is good at the random of the level, three feet below the level it is filled with that sort of vapour, and life would soon become extinct if you were to go down.

14,388. What means have you adopted besides removing the men from their work, to supply fresh air?—We have used pressure blasts, and hand-airing machines; we have both small water-wheels and pressure blasts, and hand-airing machines, and trapdoors.

14,389. Is the air taken in by iron pipes?—Yes.

14,390. Do you prefer iron pipes to wooden ones?—Yes; they last longer,

14,391. Is there any other reason why you prefer them?—No.

14,392. Do you think that the air is better conveyed in an iron pipe than in a wooden one?—Not at all; we have sometimes conveyed it in that way in wooden boxes.

14,393. Do you find any difference in the air by so conveying it?—Not the least when the boxes are made as they ought to be, but if the men are rising a long way, boxes are a great deal easier to the men; the iron pipe is a very heavy thing to take up.

14,394. That is when they are working at a rise?—Yes; and we frequently just adopt a wooden box for the sake of giving the men ease.

14,395. Do you apply the wooden box at the end of an iron pipe that is running along the level?—Yes; we fix it in.

14,510. (*Mr. St. Aubyn.*) You have stated that in your opinion the ventilation of the mines is so good that it cannot be improved upon?—Yes.

14,511. You have also stated that one of the principal causes of disease amongst the miners is the dust, and I would ask you whether the possibility of inventing a mechanical contrivance to get rid of the dust by means of water has ever been considered?—I do not know that it has ever been fairly considered, at least it has never been brought into use, the thing may just have been the subject of conversation and thought, but it has never become the subject of general discussion.

14,519. (*Mr. Kendall.*) Do you mean to say that it is probable, when the mines are not paying the cost, that the same amount of care and attention would be paid to the ventilation as if the mines were being worked at a profit?—Yes, I mean to say so in our own; if the thing cannot be fairly done the company will not do it at all.

14,520. The company are so liberal that rather than a man should run the slightest risk they will lose money?—Yes.

Mr. Thomas Wilson Crawhall, Rodderup Fell Mine.

14,532. (*Chairman.*) In sinking or rising have you ever found the air bad?—Occasionally, while we are rising.

14,533. What means do you adopt in that case?—We make a communication through to the level above, which gives us a good circulation.

14,534. Is there any means of obtaining air till that communication is made?—We just take extra precautions to close up the back rises so as to bring air forward until we get a new communication made.

14,535. Is that by closing up with wooden doors?—Yes; we generally close up all round and put trap-doors either into the drifts or in the rises, so as to close all communication excepting along one air drift, which we always have. About four fathoms above the level we have an air drift which we drive up, so as always to keep up with the level.

14,536. What is the size of the air drift?—About five feet high and three feet wide.

14,537. And that is driven above the level?—Yes.

14,538. (*Mr. Holland.*) Are your two drifts parallel to each other, one above the other?—Yes; the air drift is about four fathoms above, and we have frequent rises between the two.

14,539. (*Chairman.*) How frequently do you communicate?—Generally about every 15 or 20 fathoms. We may occasionally have it as far as 40 fathoms, but only at chance time, owing to the mode of working. We sometimes may have been able to do without an air drift by cutting a vein above and closing it up, which will form an air drift of itself; also commencing from the level where we have good air we form the rises as we go on, and that saves the necessity of putting up rises.

14,540. How do you judge whether there is bad air?—Simply from the difficulty of the candle burning and the greater heat; but that rarely occurs. And then we put a rise up to the level above, it is 30 fathoms above. We have what we call the middle level, 30 fathoms above our present workings, and we immediately make a communication with it.

14,541. But till that communication is made, and when you find that the candle will not burn, what means do you adopt?—We have never had a place in that level yet that I have known where the candle would not burn.

14,542. But you have to put it on one side?—Yes, occasionally.

14,543. What means do you adopt for supplying air; is it either by fewer men working or by stopping the working, or by artificial means?—Principally by putting on trap-doors when necessary, so as to force the air round the workings.

14,544. Do you find that sufficient?—Yes, generally sufficient

14,545. How long will the powder smoke be in getting away in a case where the candle will only burn on the side?—I cannot tell exactly.

14,546. Is it a long time in getting away?—Occasionally. It will depend entirely upon the amount of air, and that varies considerably with the weather; the weather often has an effect.

14,547. How do the smoke and foul air escape; is there an up-cast shaft where they go out?—Yes, we have one communication from the surface by means of these other levels.

14,548. Does the shaft which communicates with the other levels and to the lower level always act as an up-cast shaft?—Yes; the middle level is the principal airing source.

14,548*a*. Is it for taking the air out or for bringing air in?—It will act both ways, according to the state of the weather; sometimes what is a down-cast one day may be an up-cast another day, but more commonly the middle level is the up-cast.

14,549. And the bad air and powder smoke pass out through the middle level?—Yes, they may come out of the level mouth; there are several modes by which they might escape, but that is the principal.

14,550. Are the men ever obliged to leave the work for a time on account of the air being close?—We have no such places at present, we have had isolated places where we have been sinking or rising (generally rising) where they have had difficulty in working and where they have had to leave, especially in the month of August; we generally find that about our worst time in the year; but those are almost invariably places which we are rising to get fresh air to the workings, and of course it is worst just at the top of the rise.

14,551. Until that is completed the air is bad?—Yes, there is rather a deficiency of air, a want of circulation.

14,552. Is there any carbonic acid from fissures in the rock?—I do not think that there is any worth mentioning in either of these mines, there may be a little occasionally.

14 553 Have you ever seen any place where it was so bad that the candle would go out?—There is one place and one place only, but that is a level where there were never more than four men working, and there we some years ago made a communication with the level above which caused it to be as good for air as anywhere else.

14,554. Did those men suffer while they were working there?—If they suffered at all they came out at once.

14,555 Did they complain at all?—No, I never heard them make any particular complaint,

14,556. Have you ever yourself felt the effect of that air?—I have been in it occasionally, when it was so bad that I could not get into the forehead, but that was just at change times, it was a place which depended very much and more than usually upon the state of the weather; and I have known the men on some days work with great ease and comfort and on other days they would go in and have to come out immediately; we were in the course of putting up a rise and having communication. What made it worse was that we had water in this part and had great difficulty in getting it holed, but there were never more than four and often only two men, it being a place of no great importance, if there was any difficulty we let it stand; it is a considerable distance from the main workings of the mine, it is not near them at all.

14,587. (*Mr. Davey.*) Where do you take up your air from which you are going to communicate from one level to another? Do you take it up from the shaft or from the last winze you have communicated? You use a blast, I presume?—No, only in cases of great difficulty.

14,588. I am taking the case which you mentioned just now, where there were 40 fathoms distance from one winze to another. In that case we would put in a fan blast; we always have a few fan blasts on hand.

14,589. Where do you place that fan blast; is it from the last winze?—From the last place where we have good air, wherever it may be.

14,590. When that is communicated would you have sufficient air there?—Yes, sufficient to blow a candle out.

14,591. Although it is 40 fathoms distance?—Yes, quite sufficient.

14,592. What size is your lode generally?—It varies; it is very often about 14 or 15 feet wide; sometimes not more than six or eight.

14,598. Was there are any particular reason why you should go 40 fathoms before having any communication?—None, but that we had no deficiency of air; we would not do it unless it was good enough for air.

14,599. You had a sufficient blast to work for that distance?—Yes; if there are no other men working in there, there is no difficulty whatever in four men going 40 fathoms.

14,600. In two shifts?—Yes, two men at a time.

Mr. JONATHAN WALTON, Dowgang Mine.

14,664. (*Chairman.*) How far is the level driven in?—About three-fourths of a mile.

14,665. Are you sinking from that level or are you rising principally?—It is upon a level and above the level.

14,666. In those workings have you ever found any air when the candle was obliged to be put on the side to burn?—Not often. There are different times in the season when it is the case. Autumn is generally a bad time, but when the air is in a proper condition we generally find the candles good.

14,667. But in autumn that is occasionally the case?—Yes.

14,668. What do you then do?—We examine our air courses, and sometimes they are not in a good condition and we improve them. We open them out and then the thing goes right again.

14,669. If the air courses are in good condition you have no fault?—No fault.

14,670. How do these get filled in?—The stuff falls down sometimes and stops the course.

14,671. Have you an air course driven above your level?—Yes.

14,672. How far above your level?—Some two or three fathoms above.

14,673. At the end does it communicate with a shaft?—Yes; it communicates with a shaft about 150 or 160 fathoms from the level forehead.

14,764. Does that shaft act as an up-cast or a down-cast?—It changes, sometimes in fine weather it is a down-cast

14,675. Sometimes the air shaft is an out-cast?—Yes.

14,676. And sometimes it is the reverse?—Yes.

14,677. Have you ever used any artificial means for ventilation?—Never.

14,678–9. When you find that the air shaft has got stopped up, have the men complained to you about it or do you ascertain it?—We ascertain it immediately in the working; by the candles not burning bright.

14,680. Is that the only way in which you judge?—We see that the smoke does not go from them; it hangs round them.

14,681. How long does it hang?—When the air course is right only a few minutes.

14,682. But when the air course has been stopped up how is it?—Then it does not get away for some time.

14,682 (*Mr Holland.*) How long?—It is possibly half an hour or so before it gets away.

Mr. JOSEPH RODAM, Bentyfield mine.

14,814. (*Chairman.*) In which does the air come in, and out of which does it go?—In droughty weather the air generally soaks out of the level, and the shaft draws down, and when the weather changes there is of course a change there.

14,815. Have you ever the air so bad that the candles are obliged to be put on the side to burn?—I have not been much troubled with it for the last 8 or 10 years, but I have seen such places.

Mr. JOSIAH REMFRY, the Derwent Mine.

14,846. (*Chairman.*) How many shafts are there on that working, communicating with the surface?—There is one to the east of Jeffrey's, which is Taylor's. Those two are the principal shafts for ventilating, and they are 375 fathoms apart.

14,847. Is either of them an up-cast and the other a down-cast?—One is an up-cast.

14,848. Is that constantly an up-cast?—It is constantly an up-cast.

14,849. Are there any artificial means to make it an up-cast—Not at all.

14,850. It is natural?—Yes

14,851. Is not that affected by the weather?—Yes, it is affected by the weather.

14,852. But is it so affected as to make it become a down-cast instead of an up-cast?—No; because the elevation of one shaft is so much greater, being 34 yards above the other; that makes it an up-cast.

14,853. But it does not act so efficiently on a calm day, I suppose?—I never knew it to act on a calm day or on any other day in any other way than as an up-cast.

14,936. If you have any do you apply any artificial means of ventilation?—We have not any artificial means of ventilation at present in use. I do not believe in artificial ventilation very much; I believe that we ought to have more natural ventilation in every mine.

14,937. Before you have connected two levels by a rise or a shaft or winze, must you not then have the air somewhat close?—Yes, we have to contend with those things; then we keep one or more small fan blasts, and place pipes, and blow air during that short time.

14,938. That is what I alluded to as artificial ventilation—That is artificial ventilation, but the air is taken from a place near, where it is pure, and conveyed to the men.

14,939. How is that worked?—By hand; by a boy.

14,940. Is the pipe through which the air is blown, wood or iron?—Principally iron.

14,941. Do you know to what extent you have ever had occasion to send air in that way?—I have known it sent for 300 fathoms or more.

14,942. What is the size of the iron pipe?—Six inches.

14,943. And has that been merely by a fan turned by a boy at the end of it?—By a fan, but not turned by a boy; a fan turned by a water-wheel.

14,944. But at present you have nothing of that sort in the mine?—No, and we have no place to my knowledge which is short of air anywhere.

14,945. How long is the powder smoke getting away at the extreme end of any of the levels where you are now working?—I do not think that we have any place save one or two but where it may get away in less than half an hour.

14,946. And you have no place where the candle has to be inclined so as to burn?—Not at all.

14,950. (*Mr. St. Aubyn.*) You said that in all places, except one or two, the smoke cleared away in half an hour after the blasting; will you state what is the nature of those other places where the smoke is more than half an hour clearing away?—Those places which are furthest from ventilation.

14,951. What is the distance from a rise in those places?—The place that I allude to is about 23 fathoms.

14,952. How long does the smoke take to clear away there?—In the fore, breast, or the end, I should think within half an hour, so that the men can work comfortably.

14,953. In what level is that?—In the 40 fathoms level, east of Taylor's shaft.

14,969. (*Mr. Davey.*) You say that a mine ought not to use any artificial means of ventilation; will you tell the Commission what other means you would adopt?—When I said that, for instance, instead of two shafts being the the number I would have as many shafts as the magnitude of the working called for; I am speaking of extensive collieries.

14,970. We are talking now of lead mines?—We have so many shafts that there is no scarcity in our mine generally speaking; therefore the only artificial ventilation which we want is in making a communication from level to level, which is only of a short duration. Our levels are generally about nine or ten fathoms apart, consequently we have from four to five fathoms to sink and to rise; sometimes at the meeting point one or probably both may be a little short of air.

14,971. Then you require an artificial ventilation?—If you choose to call a fan blast fixed in pure air conveying that air to those parties artificial ventilation, that is the only ventilation we make use of.

14,986. (*Mr. Kendall.*) As I understand you, you object to artificial ventilation solely on this ground, that you do not like long drifts. You would have communications as quickly as possible, in order to prevent artificial ventilation. Instead of driving your level some 20 or 30 fathoms you would hole a winze to some other level; you prefer that to the artificial ventilation?—I do.

14,987. That is what you mean?—Yes.

Mr. THOMAS MORPETH, Derwent Mine.

16,027. (*Chairman.*) Where does it communicate with the level above?—From Jeffries' shaft we have a cross cut which goes from there to the south about 18 fathoms I should think, and we sunk on the vein there (the vein overlying) to the south about 18 fathoms. We put a sumpt down there, and the level from that I think we have driven between 60 and 70 fathoms; and that is the last communication which we had.

15,028. How far are the men now driving from the last communication?—We have only two there.

15,029. How far are they from the last communication which you have made?—I say, that from the last it is between 60 and 70 fathoms: but I only guess at that: I cannot say with confidence.

16,030. It is about that?—Yes.

15,031. How is the ventilation there?—We have not any close air there: it is very good. You may waft the candle backwards and forwards, and it will not go out.

15,032. For 60 fathoms you are away from any communication?—Yes; we have another level over above this, but we have not a communication through.

15,033. Are you putting in a rise now to that other level?—No; there is not anybody working in the other level. The prospect was very dull and we stopped it, wishing to make a discovery in the low level; and if we did so, we should put another communication through.

15,034. How long is the powder smoke getting away, when they blast at this point?—The powder smoke there, supposing they fire one hole, will, perhaps, go away in the course of 40 minutes I should think. You will see some symptoms of smoke, but not any body of it.

15,035. How soon do the men go in to work there after blasting?—I cannot say. We are not there to see them. They may sometimes go in very speedily, within ten minutes or a quarter of an hour. They are not regular about it.

15,036. Can they see to work?—Yes: they can see to work ten minutes afterwards.

15,037. But the powder smoke is not clear away for 40 minutes?—I should think so.

15,038. You have no artificial ventilation there?—Nothing different from what I am telling you

15,039. You have no pipes taken in?—There are no pipes there.

15,040. How many shifts work in the 95-fathom level?—There are two men working there.

15,041. Do they change or shift?—They are on so much a yard.

15,042. How many men in the 24 hours work there?—Two together.

15,043. Is the bargain made with two men, four men, or six men?—Two men.

15,044. Then they only work eight hours?—Yes: eight hours shifts.

15,046. When they leave no other men take their place?—No.

15,046. So that it is 16 hours without being worked in?—Yes

15,047. Is that necessary?—It is better for the place. At the same time we could work the 24 hours if it came to that, barring waiting 10 minutes or so at the holes. The place is very poor, and therefore I think that to have two men is as much as we can afford to do.

15,052. Are there any other levels above that?—Yes: there is the 30. We have had two men driving towards a rise which we have been putting up. We have two men sinking and two rising: they are all in a party.

15,053. How long does the smoke take to get away from any of those places?—The smoke goes very quickly there; it is not more I should think than five or six minutes, the great body of it.

15,066. In all those places the air is good, the candles will burn?—The air is capital, the candle burns nicely.

(C^{n}.) Ventilation.

15,057. Have you ever seen a place in the mine where the candle was obliged to be put on the side to burn?—Yes sometimes, where I have had to slant the candle a good deal to get it to burn, but not of late years; since Mr. Taylor got hold of those mines they have been well ventilated.

15,058. In what manner have they been better ventilated?—By putting up rises and sumpts and giving ventilation close up to the fore-breast, and it is the way to win the ground, it proves the ground and shows whether there is ore in it or not; the men are able to give much better labour when they are well ventilated.

15,059. You have no occasion to put in artificial ventilation in any part of the mine with which you are connected?—We hope not at present to my knowledge.

15,060. Where does the powder smoke and foul air go to?—We have different shafts; sometimes it goes up one day and the next down, the highest shaft takes the pull.

15,061. But still the highest shaft is not always the up-cast shaft?—Not always; I have seen it a down-cast.

15,062. That is when it is affected by the weather?—I think so.

15,090. (*Mr Kendall.*) But taking them as miners do you think that the ventilation is about as good as can be in your mine?—I think that it is so; if we go a certain distance we give another communication through; wherever we find the air getting dull we consider it better to do so we can get a great deal more labour done; if a man is working in a bad air place he is not able to give much labour.

15,095. The ventilation now is better than it was ten years ago?—A great deal.

15,096. And ten years ago it was better than it was ten years before that?—I dare say.

15,097. Then it is possible to improve it a little more still?—I dare say it is.

15,098. (*Mr. Holland.*) What improvements have been made in the last ten years in ventilation?—By putting more shafts down and putting what we call sumpts, that is, a a communication between levels; we put the communications between which causes a draught of air to work from one place to another.

15,099. Anything else?—No.

15,100. Are the levels any wider than they were?—Yes; I think that since Mr. Taylor took hold of it they are wider levels than they were formerly.

15,101. Are they any higher?—I think they are a foot higher some of them.

15,102. And how much wider?—From six inches to a foot.

15,103. And are they shorter between communications?—Yes.

15,104. Does the powder smoke hang less now than it did?—Yes, much less, that is the case when there are more sumpts and more shafts.

15,105. What difference of time is there in the hanging of the powder smoke from what there used to be ten years back?—I do not recollect; it depends a vast deal upon the place.

15,106. What was a common time for the powder smoke to hang ten years ago?—It just depends upon how the weather is; there may have been some places in that time where it would be nearly all day; supposing they went in at 6 o'clock, and fired, it might remain until 2. They may now get in in ten minutes, and sometimes less.

15,107. Is it a very unusual thing for powder smoke to hang an hour or two?—Yes; at the same time you may smell it, and say that there has been powder.

15,108. It hangs about sufficient to smell, but not sufficient to prevent working?—Yes, but there is nothing to do any damage.

15,109. Are you sure that there is very much less powder smoke in the mines now than there was ten years ago?—Yes, I am confident that there is much less now.

15,110. Very much less?—Yes.

Mr. Thomas Ware, Stone Croft and Grey Side Mines.

15,332. (*Chairman.*) Are there any places where you are obliged to provide artificial ventilation?—In some places we have a fan-blast, that is, at two places, and they are worked by a water-wheel.

15,323. Is the air carried in wooden or in iron pipes?—In iron pipes We have at one part wooden pipes for a short distance, but not long.

15,324. The fan is worked by a water-wheel?—Yes.

15,325. Do you find that that is quite effectual?—Yes.

15,326. How soon does the powder smoke clear away when that is at work?—It depends partly upon the weather at the surface. In very hot weather it does not get away so fast, when there is not much of a breeze outside.

(C^{n}.) Ventilation.

15,327. Is one shaft always up-cast, or does it vary?—It varies; sometimes it is down-cast. It depends partly upon the wind and the weather outside. It is not always an up-cast

15,328. Is the one shaft that is up-cast any higher than the other one?—Yes.

15,329. But that does not ensure its always being an up-cast?—No; but generally speaking that is the up-cast shaft.

15,330. Are there any men working in the mine who are at all affected in their breathing?—No; ours is only a young mine. It was commenced in 1851, and we have not many old miners; they are generally young men.

15,355. (*Mr. Kendall.*) As far as you have observed, is the ventilation good in your mines?—Yes, I consider it good; there are some places that you cannot ventilate when you are sinking sumpts and winzes to ventilate a place; you will occasionally have a place that is bad.

15,356. Have you had a place that was bad lately?—We have one that is not very good just now.

15,357. In what part of the mine is that?—I have a plan here upon which I will show you (*pointing out the same*).

15,358. At 35 fathoms from the adit level going west the ventilation is bad?—Yes.

15,359. How far must you drive before you effect a communication?—From eight to nine fothoms.

15,360. Before you can communicate you will have to drive over 40 fathoms?—Yes.

15,361. How do you send the air in to the men who are now working at that end?—It comes up from the adit level.

15,362. As I understand you, a great portion of the 35 fathoms is already worked away?—Yes; we are obliged to work it whether it is good or not to ventilate to a certain extent; there is a little ore in it.

15,363. Is it bratticed at all?—Yes; it is boarded.

15,364. It is sollered over to within about 12 or 14 fathoms of the end?—Yes.

15,635. And notwithstanding that the ventilation is bad?—It is not bad, and it is not good.

15,366. Are the men obliged to hold the candles on the slope?—No, not at all; the candles burn upright

15,367. How many men are working at a time?—Two men at a time.

15,368. How many shifts have you?—Three.

15,369. Are you sinking a winze at the same from the 15 fathoms?—Yes.

15,370. How far down is it?—Between three and four fathoms.

15,371. How long will it be before you hole?—Between three and four months.

15,372. Shall you use any fan?—We have not put in any yet; and unless it gets worse we shall not put in any.

15,373. Do the men appear to suffer when they come out, do they complain?—Sometimes they do.

15,374. It depends upon the state of the atmosphere, does it not?—Yes. I have heard them complain occasionally, but not often.

15,375. Do you observe anything in their looks indicative of suffering on their part?—Nothing more than in the other men.

15,376. Are they young men, generally, or old men who are there?—Young men generally; some of them are about 35.

15,377. Is that the result of accident, or do you choose them?—No. We take them as they come.

15,378. Would the older men refuse to work there?—No. I may have two or three that I have taken on recently just to give them bread, who might object to going there. Some very old miners who are not able to do much, might object to going in; but in fact I would not put them into a place of that kind.

Mr. Joseph Denning.

15,397. (*Chairman.*) The levels are driven in a long way from the air, are they not?—Yes.

15,398. I suppose you have seen artificial means of ventilation resorted to?—Yes, we have occasionally used them.

15,399. What kind of artificial means should you recommend as the best?—Either water-blast or fan-blast, either of them.

15,440. Do you mean a fan-blast worked by a water-wheel?—Worked both by hand and by a water-wheel.

15,401. Is the hand fan-blast as efficient as the other?—It entirely depends upon how far you want to convey the air.

15,402. How far can you convey it by the fan-blast?—I fancy it can be conveyed 300 or 600 yards.

15,403. Is there any difference whether you send the air in wooden or iron pipes?—There is a sort of tin pipe that is generally used in our district; but I think that wooden boxes are a still more general practice.

15,404. Are there any iron pipes used?—Yes, but they are not of such general adoption; the others come cheaper, and answer the same purpose, or they are something like the same thing.

Mr. George Henderson, Fallowfield Mine.

15,434. (*Chairman.*) In driving do you meet with any ends where the air is bad?—Yes; sometimes.

15,435. What do you do when that is the case?—We generally contrive to make a current of air play on the place, either by artificial means or by natural means, just which is most convenient; we always find that it is most advantageous to make the air good for the workmen.

15,436. What are the artificial means that you resort to in that case?—The fan-blast generally, when we have to do it.

15,437. Is it worked by an engine?—It is worked both ways; sometimes it is worked by band when only for a temporary purpose.

15,438. What pipes do you use?—We generally use wooden boxes; we have some metal pipes, but generally we use wooden boxes.

Mr. John Ridley, Coalcleugh Mine.

15,514. (*Chairman.*) In which level should you say there is the worst air?—We have very few places of that description, they are all very near to where there is a circulation. We have one or two levels which are between 20 and 30 fathoms driven, where it is a little bad, and in those places we supply them with an air machine or some other blast, we sometimes get a water blast.

15,515. At which level should we find it if we went to see it?—There is a level which we call the Captain's level, and their is one in Whitewood vein, where they are just beginning to rise; that is as close an end as any which we have, I think.

15,521. Have you any ventilating machine now worked by water?—We have one a pressure, water blast, and a few air machines, turned by hand.

15,522. Is the air carried in iron or wooden pipes?—In iron pipes generally.

15,523. Are they taken up into the rises?—Yes; wherever it is wanted.

15,524. When it is going up into the rises do you take any precaution against the stuff falling into it?—Yes, of course.

15,525. What precaution?—There is sometimes a brattice.

15,526. If you take the iron piping for the air up into a rise, what is to prevent the earth falling into it and stopping it up?—They put a wooden box at the end of the iron one, with a grate or piece of sieve to cover it, and there is a wooden box at the bottom, where there is a sluice to let the dust out.

15,530. (*Mr. Davey.*) What is the greatest distance which you have from any shaft or from any place where you can ventilate?—Between 20 and 30 fathoms.

15,531. How do you find the air in that place?—When they go beyond 20 fathoms we generally think they require an air machine, and that is when it is set to work.

15,554. (*Mr. A. Bruce.*) Do the men ever make complaints to you of insufficient air?—Very seldom, because we soon know when they require more air.

15,555. When they do complain to you, what is your course?—We generally make the working men comfortable as soon as we possibly can.

15,556. Are their complaints always attended to?—I think they are.

15,557. Did you ever know them make unreasonable complaints?—It is very seldom that they make any complaints. If they make application that they want an air machine, or anything of that sort, then, if we consider it necessary, we set to work and get a machine in as soon as we can; that is the practice.

15,571. (*Mr. Kendall.*) Have you any air pumps used at all?—No.

15,572. Not on your mine?—Not on our mine.

15,573. All you use is the common fan before you connect?—We have little air machines which are turned by boys, and there is a blast like a pressure of water.

15,570. The ventilation is generally very good, you say?—It is.

Mr. William Curry, East Allendale Mines.

15,831. (*Chairman.*) Is the gunpowder smoke long in clearing away in any of the ends in which the miners are working?—No it is not, with the exception of one single place in the whole of the mines.

15,832. Where is that?—That place in the southern part of Victoria vein.

15,833. What are you doing there; is it a rise that you are putting in?—No, they are merely working the drifts; there is a regular communication through, but the draft is not strong enough to take away the smoke quickly.

15,834. Have you employed any artificial means?—Yes, all the artificial means that we could use, such as placing trapdoors, and confining the current to one course; in other cases we have succeeded, in this case it is not so good; but there are only four men working in that place.

15,835. Do you use a fire-blast down below?—None below, but there is one at surface.

15,836. Have you any shaft by which to draw out the foul air?—Yes, there is one below the surface I spoke of for that purpose.

15,837. Where is that?—That is a little south of Allenheads, and communicates with the principal workings in Henry's vein, by the plantation cross cut, which is 600 fathoms in length.

15,838. Have you no means on the mine for drawing out the air by exhaustion?—We have one on the Blackett level works.

15,839. Does that answer?—I can scarcely give a decided answer upon that.

15,840. Has it been long used?—It has been in practice hers for about 16 months.

15,841. What do you think is the best mode of ventilating a place where the air is bad?—In sucking the air out there is this advantage, that it keeps the level all clear alike from one end to the other, I consider when the pure air is blown in to a fore end the men have better air to work in; but the great danger then is of the foul air accumulating behind, and clogging up, so that they could not get out; I have known instances of that kind where the men have had to come through some portion of the drift where they could not carry a lighted candle; and drawing the air out avoids that.

15,142. Have you known it to happen that after the men have been working and have been supplied with pure air they had to pass through bad air where the candle would not burn?—Yes, I have seen that.

15,843. I suppose that there is nothing of that sort now that one could see?—No. I do not know that it has occurred more than twice or thrice, and always in the same place, the plantation cross cut.

15,844. That, I believe, is where you have now a furnace?—Yes.

15,845. Has the furnace remedied that state of things?—Yes; it has effected a decided improvement.

15,846. Do you at all know what quantity of coals are consumed in that furnace?—I cannot answer that question off hand.

15,847. (*Mr. Davey.*) Can you assign any reason why the air should be stopped all at once after blowing fresh air in so as to prevent the men from going back again?—I cannot, except from the quantity forced in not being in proportion to the requirements of the men, and at the same time to force the smoke out of a drift 600 fathoms in length, as in this case.

15,848. Was there sufficient air for the men to work in at the end?—They could work, but not comfortably; there was certainly not sufficient.

15,899. Had there been sufficient air forced in would not that have been enough to extract all the impure air?—Yes, certainly.

15,850. Are there any cracks in the limestone?—Yes.

15,851. Do you think that there is any escape of carbonic acid gas from those cracks?—Yes, large quantities at times.

15,852. So much so as to extinguish a candle?—Yes.

15,853. Have you ever known an instance in which the men have been affected by it?—No, I am not aware of that, I have tried it repeatedly with a candle.

15,854. That would of course affect the whole of a working?—Yes; in that part of the district, so far as those men were concerned; not the whole district, but in that partnership.

15,859. (*Mr. Kendall.*) Since you have been a miner, and since you have been an agent, has there been any great improvement in the ventilation of the mines?—Yes, a decided improvement.

15,870. Has the health of the men become very much improved since that?—I think the health of the men has improved.

15,871. Are the working hours now as many as they were when you first commenced?—Yes

15,872. Eight-hour cores?—Yes; but they are more punctually worked now than they were formerly.

15,873. You are of opinion that the ventilation has been very much improved, and that the men work more comfortably; but that the hours of working are the same now as they were before?—Yes.

15,874. What should you imagine in consequence of the improved ventilation and other improvements which have been made, is the increased value of the labour performed in the eight hours; or, in other words, can a man do as much work under the improved system in six hours as he could in the olden time in eight hours?—He ought to do it in some of the fore ends, if he was willing.

15,875. He has the ability to do it, if he likes, with the same wear and tear of constitution?—Not generally speaking; only where the places were so very bad for air.

15,876. What do you think that a man, with the same wear and tear of constitution, can do now during eight hours, compared with 25 years ago; do you think he can do 20 per cent. more work, or one-fifth more?—He could not do that, generally speaking.

15,877. Do you think he could do 10 per cent. more?—That is a subject I have never fairly thought about; but I think 10 per cent. could be accomplished if confined to the fore ends, for these are places where the greatest improvement in the ventilation has been made, but not throughout the whole mine.

15,878. Where there is good air have you any doubt that a very large per-centage more of work can be done?—Yes, I have known places where, previous to communications being made, the men were allowed to go in and work as long as they could and come out when they liked; sometimes they worked three hours, four hours, or six hours; but the air varies in the same place, it will vary considerably on different days and in different weeks.

15,879. It would vary with the state of the atmosphere?—Yes.

15,880. At present there are no cases of that kind, I suppose, the ventilation is generally good?—Yes; it is generally good.

15,881. Either by the use of a fire machine or a pumping machine, your ventilation is good?—Yes; I consider it very good.

15,882. Have you heard any complaints made within the last six months, or 12 months, of bad air?—None.

Mr. Thomas John Bewick.

15,905. (*Chairman.*) Have you different modes of ventilation in use in those mines?—Yes.

15,906. Will you be good enough to describe to the Commissioners the different means that you resort to?—They are both by exhaustion and propulsion by means of water-wheels or other motive power, driving fans and similar machines; we have also recently introduced furnace ventilation. The plan adopted on the Blackett level here is so far entirely by exhaustion by Byrom's patent another fan, one of which is at work within three-quarters of a mile of this place, and also by a machine somewhat similar to Struve's system, this method is in operation close to this place. At Allenheads and other mines for propelling the air into the workings, we have the ordinary blowing fan, and a sort of bellows which is worked in a box with valves and likewise a piston working horizontally in a cylinder or box with valves. Under certain favourable circumstances we also occasionally ventilate by the water blast.

15,907. (*Mr. Austin Bruce.*) Is the air, in these cases, forced generally through the workings, or only into certain special close ends where the ventilation is imperfect?—Only into the special fore ends where there is no natural ventilation.

15,908. In the case of Struve's exhausting machine, is that applied only to special places?—Only in special airless fore-heads.

15,909. And how is it with regard to the furnace?—That applies to a district; it affects the general ventilation of one large mine. Our machine ventilation is merely for special places. I may say that generally it only applies to close fore-ends where there is no through communication. The furnaces that we have erected are for ventilating a series of levels and workings which extend over a considerable area, they are for exhausting at one point, and of course the fresh air enters the mine at the various inlets by its own gravity, and replaces the impure air that is exhausted by the furnace.

15,910. What quantity of coal does a furnace consume?—About three tons a week.

15,911. What coal do you use?—County of Durham coal, from the neighbourhood of Bishop Auckland.

14,912. What is the cost of that coal here per ton?—At Allenheads it costs 14*s.* 3*d.* per ton, at the Weardale furnace the cost is 17*s.* per ton: the price of the coal at the pit is only about 5*s.* 6*d.* or 6*s.* per ton, but the carriage adds greatly to the cost.

15,913. What sort of furnace is it?—The furnace is placed at or near the top of the shaft, which is closed, a communication is made in any convenient place down the shaft, and a covered air tight passage made from it to the furnace, which is simply a series of bars on which the fuel is placed, and at the other end of the bars is a chimney a few feet high; at Allenheads it is 40 feet; it was first tried 10 or 12 feet in height, and answered very well; any moderate height is sufficient; at the side of the furnace there is a door above the bars for feeding, and another below the bars to take out the ashes.

15,914. Have you calculated what addition was made by the furnace to the amount of air passing through the mine?—No, but I may say that in one particular part of the mine prior to the furnace at Allenheads being lighted in July of last year, the men in dull damp weather were frequently prevented from working by a want of ventilation, and since that they have not lost any work, and speak very favourably of the effects of the furnace.

19,915. The men, I suppose, would not leave work until the condition of the mine were such as to be injurious to their health?—They would not.

15,916. How far off is the furnace?—Upwards of a mile from a part of the working, and the levels are at different elevations and in various directions.

15,917. Before you had the furnace in operation a mile distant from them, they were places in which the men could not at times work?—The places where the ventilation was so deficient prior to the erection of the furnace are three-quarters of a mile ditant, but even at a mile the ventilation is improved.

15,918. Now the men are never hindered from working, and you attribute this entirely to the furnace?—Yes, the improved ventilation is entirely due to the furnace.

15,919. Do you employ no other means besides this furnace for the ventilation?—Except in airless fore-heads no other artificial ventilation whatever.

15,920. It is all effected by this furnace?—Yes. Two months after the furnace was first lighted we put it out, just to try whether or not it was beneficial in what we considered was favourable weather, that is to say, the temperature was low, and the wind was from the north; the miners left their work as usual at two o'clock in the afternoon, the furnace was extinguished at five o'clock in the evening, and next morning at six o'clock when the men returned there were very few of them who could get to their place of work.

15,921. Is the shaft at which the furnace is, an upcast shaft for all the mines?—Not exclusively so, there are other upcast shafts; since the furnace was erected it is exclusively an upcast, but it is not the only one at Allenheads.

15,922. Did you not state, that within the period during which this furnace had been in operation, no mechanical means were ever used for driving air into the close ends?—We almost invariably apply either manual or other power for the purpose of propelling air into the close ends, whether there is a furnace or not.

15,923. (*Mr. Davey.*) Which method do you most approve of, that of exhausting the air, or forcing it in?—Exhausting it.

15,924. (*Mr. Holland.*) The exhaustive power is in proportion the height of a column 40 feet high?—Yes, and the effect of the fire in the furnace.

15,925. The chimney is 40 feet high above the fire?—Yes, we have one in Weardale only seven or eight feet high.

15,926. Is it not a weak draft?—No, it creates a good brisk draft.

Mr. Joseph Cowper Cain.

15,932. (*Chairman.*) What is the longest level which you have?—Burtree Pasture is the longest; it is two miles within 11 fathoms.

15,933. The work is brought out by horses?—Yes.

15,934. What is the depth under that level which you have been working. If I understand you rightly, the present end is about 105 fathoms from the surface?—Yes.

15,935. Have you made a shaft under it?—Yes, of 131 fathoms.

15,936. How many levels have you under the one which we have gone into?—Five below the horse level.

15,937. How are those ventilated?—By the air going in at the two level mouths The shaft above the engine shaft supplies the water to the engines, the water-wheels, and it is divided and goes along those different levels, and then out of the shaft at Middlehope Head, at the top of which the furnace is lighted.

15,938. Have you any of those lower levels which are deficient of air?—No; there are none more deficient than the one which you have been into to-day, at the end.

15,939. Do you use artificial means to carry the air into those levels?—We use none, excepting what is blown from the last rise or sinking to the ends, and that is done by hand by boys.

15,940. By hand-blast?—Yes

15,941. You have recently erected a furnace for better ventilation?—Yes.

15,942. What has been the result of that?—It has only been lighted four or five days, and so far the result is very beneficial, apparently; but it has not been lighted a sufficient length of time yet to enable us to judge of the change which may take place.

15,943. But are there times when you cannot enter the horse level for want of air?—Yes; several times lately, we could not do so for want of air.

15,944. Consequently the men could not follow their daily work?—They could not.

15,945 From what you have seen of other mines, do you think there is every chance that this furnace will remedy the defect?—I have every confidence that it will answer there and ventilate the mine effectually.

15,946. Have you seen it at work in other mines?—Yes; at Allenheads mines for upwards of a year.

15,947. And that has been very satisfactory?—Very satisfactory indeed.

15,948. Do your men suffer much from working in these close ends?—Not a great deal; not so much as might be calculated upon.

15,949. Have you many at this moment who are off their work from illness?—Very few; there are not more than two or three altogether out of the whole number.

15,950. Is that caused by what you term the miners' disease, or from any other cause?—I think other complaints; it is not caused by the miners' complaint; I do not think that we have a single on at present who has the miners' complaint. We may have old men who are really not fit to go in any more; but then old age and the length of time that they have worked are the causes of that.

15,951. What is the age of the oldest man that you have working?—73.

15,952. Have you any working above 50?—A great number; we have 85 above 40. In the Weardale district there are 102 shafts, from 3 to 105 fathoms in depth. The total length of levels is 20,609 fathoms, being $23\frac{1}{2}$ miles; the price is from 2*l*. 10*s*. to 20*l* per fathom; $14{,}813\frac{3}{4}$ bings of lead ore is the average produce for 5 years ending the 30th June 1861. There is a total of 1,133 men and boys, of whom 877 men and boys are underground; of the latter number there are 49 under 16, 106 under 21, 281 under 30, 182 under 40, and 259 above 40. Of the 877 there are 469 on bingtale, and 408 on dead-work, labourers, rail-layers, trappers, &c

15,953. There is a large proportion of your men above 40?—Yes.

15,978. (*Mr. St. Aubyn.*) The end in which the Commissioners were to-day is 40 fathoms from a rise?—It is.

15,979. How far do you expect to drive before you get fresh communication?—Perhaps another 10 or 15 fathoms; much depends upon circumstances.

15,980. That would be from 50 to 55 fathoms?—Yes.

15,981. You have it in contemplation to put in a trap door in the horse level where we were to-day?—We have it in contemplation to put in several, but particularly one in that part of the mine which you visited, which I think will have a very beneficial effect.

15,982. It is usual to drive so far as 50 fathoms from a rise without additional air communication?—Yes, it is usual; but when the ground is productive it is put up at 20 fathoms, but that is done for the convenience of working more than for ventilation; 50 fathoms is not a great distance for ventilation.

Mr. John Walton.

16,027. (*Chairman.*) You have lately put up a blast furnace for the purpose of ventilation, have you had it long enough to give an idea what the effects of it are?—There is no doubt that there is an improvement since it was put up.

(Cn.) *Ventilation.*

16,028 There has been already an improvement?—Yes.

16,029. Before that furnace was erected it was frequently the case that men were obliged to retire from the work?—Yes, often during the July, August, and September months

16,030. In going through this level since the furnace has been erected, do you not find it much cooler?—Yes, it is much cooler.

16,031. You went in with us?—Yes.

16,032. Did you hear the expression from a miner who was waiting there that he was nearly frozen from waiting so long?—Yes; I heard him make use of that observation.

16,033. Did you ever hear that observation before?—No.

16,096. (*Mr. Austin Bruce.*) Are there any portions of this mine where the air is decidedly less good than in others?—The only place where it is worse than in the other mines is where we have been to day; but it is improved by this furnace, and is much better.

16,097. In those places are the men able to work for the whole of their ordinary time?—In nearly the whole of the mines they are, with the exception of this place.

16,098. I ask whether, in those places where the air is less good than it is usually, the men are able to work their usual day's work of eight hours?—No; they are not able.

16,099. How long do they work there?—They are not restricted; they use their own discretion in a great measure where it is bad for air, we do not force them to stay.

16,100. They work a shorter or a longer time, according as they feel that they are able to bear it?—Just so.

16,101. Have you ever known men the worse in health from continuing to work in that bad air longer than they ought to have done?—No.

16,102 Is there any escape of gas into the levels from the rock?—Very little; I have scarcely ever seen that

Robert Walton Bainbridge, Esq., Teesdale and Alston Moor Mines.

16,227. (*Chairman*) What means are adopted for forcing in the air?—I mean forcing in the air where we are driving a level, by a water blast or a fan blast.

16,228 Is the fan blast worked by water or by hand?—Sometimes it is worked by men, and sometimes by water power. If we are driving a long level, our object is to get a water blast down a shaft, or from the inclination of the hill, which we are generally able to do from the springs, bringing them down in close pipes, and so get 15 or 20 fathoms of pressure, as we find it convenient, and then the escape of that water through an opening in the bottom, into a pipe at the end, forces the air forward a great distance.

16,229. Are the pipes by which the air is carried on, made of wood or of iron?—They are made of iron generally, that is, cast iron; we may use wooden pipes for a small local purpose, or a temporary one.

16,230. Do you ever use zinc pipes?—No, we have not; the pipe is five inches inches internally.

16,231. Is that the general size of the pipes?—Yes, the universal size.

16,232 When you are putting in a rise, are the pipes then carried up?—Yes, they are carried up the rise.

15,233 What means are taken to prevent it from filling up, when the pipe is taken up a rise?—They will so place it as that the stuff will not come into it, or a perforated bose is used.

16,234. That is always carefully looked to by the agents, is it?—Yes, otherwise it would neutralize all our other efforts.

16,290. (*Mr. A. Bruce.*) Have you many shafts over your workings in Teesdale?—Yes, a great many.

16,291. Does the upcast air generally ascend through them, or pass out at the levels, or both?—It depends upon the state of the atmosphere; sometimes the current will be one way and sometimes the other.

16,292. Have you any fixed upcast or downcast shafts?—No.

16,293. You do not attempt to conduct the air in regular courses?—No; we have not the need of that. The only thing in that respect is this: supposing that we have a level going, and that we have an opening drift above, then the air will pass along the level up the furthest working and back with the drift; that may be said to be comparatively the same as in the coal fields.

16,294. It is conducted in that case?—Yes; and any opening would in that case be closed.

16,295. You would have doors put up?—Yes.

(C^{B}.) *Ventilation.*

16,301. The ventilation in all your mines, I presume, is pretty good?—I consider it good as a whole.

16,302. And equally good?—When there is a larger number of men in a given locality, of course the air will not be so good as with a smaller number.

16,303. But as between the different districts, is there any difference?—Westmorland may be said to be the best ventilated, naturally, owing to the rocks there being of a more broken character, and the fissures themselves yielding air independent of artificial ventilation.

Mr. William Lee, Wire Gill Mine.

16,824. (*Mr. Kendall.*) I wish especially to ask you as to the ventilation of this mine. How long has this mine been working?—Perhaps some nine years.

16,285. To-day we have been into the fore-end of the level. What distance is that fore-end of the level from the entrance here?—Between 600 and 700 fathoms.

16,826. About how far in from the day level is it before you come to a shaft which communicates with the surface?—265 fathoms.

16,827. Is that an upcast shaft generally?—Yes, generally speaking.

16,828. Does it ever become a downcast shaft?—Occasionally.

16,829. But seldom?—In the summer season perhaps.

16,830. In what months of the year does that occur?—In the latter part of July as much as any time.

16,831. You use a great deal of powder, do you not?—Yes.

16,832. You blast all?—Not all.

16,833. Nearly all? There has been a time when we did not blast so much as we do now.

16,834. In the latter end of July, when it becomes a downcast shaft, where does the powder smoke go?—Out of the level mouth.

16,835. Then, as you are blasting all day, you must have a continued flow of smoke out through the level?—Yes.

16,836. Do the men suffer much going into the level at that time?—I think not. They do a little, but when the smoke has come that distance the bad effects are partly gone.

16,837. It having been scattered through such a distance?—Yes.

16,838. How long does it take to come through that level?—Eight or ten minutes.

16,839. How long is it from the before-mentioned shaft before you come to another shaft?—Perhaps it would be some 80 fathoms.

16,840. How is your ventilation generally carried on in the different workings?—The principal ventilation is by day shafts from the surface, and from open levels at a higher random communicating with the level at the lower random.

16,841. The communication being from one random to the other, and there being every now and then a communication with the surface?—Yes.

16,842. In your experience does that create a sufficient ventilation for the men?—Yes.

16,843. How do you manage when your fore-head is a long way off from the last air point?—We place a water blast so as to throw air into the fore-head.

16,844. Have you a water blast now in your fore-head?—We have a water blast in the levels where you have been, which is 120 fathoms back from the fore-head, and air is forced by the blast in pipes to within about a fathom of the fore-head.

16,845. Your fore-head is 120 fathoms from any air communication?—Yes.

16,846. And the whole of that supply of air is driven by a water blast?—Yes.

16,847. How many men wark there at a time?—Two.

16,848. How long does the powder-smoke lie there?—It is rather difficult to speak positively about that; perhaps we throw in nearly 100 cubic feet of air in a minute.

16,849. How long is it before the men enter again?—Ten minutes or a quarter of an hour; they are not tied; it is at their own discretion.

16,850. Do they go in too soon?—I do not think that they are apt to go in too soon. They seem to have a regard for their health, and a knowledge of what is beneficial to their health.

16,851. Are they a more careful body of men than they used to be?—Yes, much more. They are much more careful since I commenced working in the mine as a miner.

16,852. What is the level for?—One object is to communicate with the level from the adjoining mine.

(C^{B}.) *Ventilation.*

16,853. What is it called?—Little Egglesbope mine.

16,854. Have you a jet of water there?—Yes.

16,855. What is the difference between the two points?—130 fathoms.

16,856. How long will it be before you communicate?—A twelvemonth.

16,857. You will have no communication with the surface before that?—We have not arranged to have it. If we find our blast sufficient we go through without any other communication.

16,858. Do you think that the blast will be sufficient?—I think that it will be perfectly sufficient.

16,859. How many men are there working at each end?—Eight at each end, two to be in each eight hours at a time; their time is specified as eight hours; they are not exactly tied to that; they may make it shorter; the men get something like seven hours each, taking it in that rotation, for the week; we cannot get the 40 hours in those leading places. If you take the time from Sunday to Sunday we cannot get 40 hours in a week, so that the average time may be taken at something like seven hours.

16,860. (*Chairman.*) Will you state why?—Because there is not time between; two men commence, and during the time for four sets of men there are not so many hours as that they can get in the whole time, and we allow our men to be at home on the Saturday night, so as not to interfere with the Sabbath, and not to leave their homes till the Sunday has gone.

16,861. When the one pair go out do the others go in?—Yes.

16,862. How soon afterwards?—Perhaps those who are in may come out to the mine shop, and the others will go into their place, or if they are a little longer than the time, these may leave the mine shop and change with them, or they may meet on the way.

16,863. Do they work night shifts?—Yes, in this case they must. As a general rule, they change at the place, but has to give time for the fore-head being cleared of smoke by the blast, we require eight hours where it is practicable.

16,864. (*Mr. Kendall.*) According to your calculation, how long do you think that you will be in communicating from one mine to the other?—Twelve months, according to the best of my judgement.

16,865. From your experience, as far as it has gone here, do you think that you will be able to give these men, by the water blast, a sufficient quantity of air to work there with safety?—Yes.

16,866. Do you think that you shall be able to keep up pretty nearly as good air as we had to-day?—Pretty nearly we shall lose a little with the friction of the pipe.

16,867. You have sufficient fall and sufficient water in order to increase the power, if necessary?—Yes.

16,868. You have no doubt that the men can work there without injury to their health until the communication is made?—Yes, so far as the air goes; there will be a little injury from the smoke and the dust, and we cannot prevent the fume which arises from the candle.

16,870. To-day we tried the thermometer, and it was 60° in the end; have you ever had it tried before?—We do not do much in that way.

16,871. Generally speaking, it is much the same as to-day?—Yes, much the same.

16,872. Winter and summer?—Yes; there is not much change in it.

16,873. The men do not complain of heat or of cold?—No, the temperature is very much the same.

16,874. (*Chairman.*) In your opinion you will be able to supply sufficient air, but if not, you might join with the upper level?—If we found it not sufficient we could do that; but I have no doubt that what we are doing now will be sufficient.

16,875. What distance would it be to join with the upper level?—Perhaps about 20 fathoms.

16,876. In driving a rise, how do you supply the air?—In a similar way; we have a blast, and we take a column of pipes up to the rise top, to where the men are working. We divide the rise with a partition.

16,877. Would that sized pipe be sufficient to supply air for the rise as well as for the end?—Yes.

16,878. (*Mr. Kendall.*) You do not at all anticipate going to the surface?—No; we have no reason to think but what we can throw sufficient air into the place otherwise.

18,879. (*Chairman.*) When you rise, you turn the iron pips up and carry it up as the men go on?—Yes, we have an angular pipe or a circular pipe.

16,880. To enable you to take it up the rise?—Yes.

16,881. What precautions do you take against the pipe being filled up while the men are working?—we have what we call a cap to the pipe, which is on when they fire a shot, and if anything comes down we have an opening at right angles, and so we can let it out.

16,882. You depend entirely upon the men putting that cap on?—Yes; when they are working for a blast they can take it off altogether.

16,883. In winter, when the water freezes, what do you do?—We sometimes cover our watercourses over.

166,884. But the water does freeze sometimes?—It is very rare that we are ever stopped in winter.

16,885. Supposing it to be frozen, what should you do?—Of course we could not have water; but we protect ourselves against that. We cover our watercourses with wood, and the water comes away; and supposing it is frozen over, a spring underneath will come through. We have men to look after it.

16,886. You are never obliged to stop working owing to the water freezing and not being able to supply the blast?—That very rarely occurs, but occasionally it may occur, and in that case we should temporarily remove our men.

16,888. (*Mr. Holland.*) You have said that sometimes the shaft becomes a downcast?—Yes.

16,889. Is your draft as good then as when it is the upcast?—there is tolerably a good draft then.

16,890. How long was your air pipe when you first began using the water blast?—Perhaps 10 fathoms.

16,891. How long is it now?—120.

16,892. Is the blast much weaker now than it was at first?—It is a little weaker; there is the friction that the air has to contend with.

16,893. Is there any considerable leakage, in your opinion, from the pipe?—Not much of that; we look after that.

16,894. It is very much weaker, or only a little weaker?—Just a little.

16,895. Then you may carry it another 100 fathoms?—We have driven with a blast similar to this, I believe, 600 fathoms.

86,896. With the same fall of water?—Yes.

16,897. And a good blast?—A tolerable blast.

16,898. Have you measured the quantity of air driven and of water flowing?—Perhaps 18 gallons of water a minute.

16,899. How much air?—From 90 to 100 cubic feet may flow in a minute.

16,900. Have you measured that?—We have measured another one, and it was 103 cubic feet; it is on the same principle, and I think that this would be a little less, say 95 cubic feet.

16,901. You have said that as far as the air goes the blast does very well, but that there are powder smoke, cankle smoke, and dust?—Yes.

16,902. Do you mean that there are more of those annoyances than in the ordinary workings; there is a little more in the leading fore-heads than in the open workings.

16,903. Is that because it is more confined, or because the ventilation is worse?—It is more confined.

16,904. Do you attribute the greater annoyance of powder smoke, candle smoke, and dust in the headway to the confined space, or to some little deficiency of ventilation?—It is principally from the confined space.

Mr. JOSEPH PATTINSON, Little Eggleshope Mine.

16,918. (*Chairman.*) How is that ventilated?—By means of what we call a pressure blast; a water blast.

16,919. How far do you think that it would be safe to drive with that means of ventilation, in your experience?—It depends upon circumstances; by means of a water blast we have driven as far as 500 fathoms: not with this identical blast, but another blast.

76,920. With what sized pipe did you drive the 500 fathoms?—I cannot say exactly; I should say five or six inches.

16,921. (*Mr. Holland.*) Such a pipe as that which we saw?—Yes; a metal pipe.

16,922. (*Chairman.*) You think that that is quite sufficient?—That is an extreme case; we generally do not drive more than 100 fathoms without communication.

16,923 But you found this pipe quite sufficient?—Quite sufficient; we have done that.

16,924. Have you taken the same thing up a rise?—Yes; we generally rise so far, and sink to meet the rise to get a communication with the surface.

16,925. When you sink or rise do you always apply the pipe?—Yes.

16,926. (*Mr. Holland.*) Is that level always as pure and as fresh as we found it to-day?—Yes; it is not more than an average to-day.

16,927. It is a fair average?—It is a fair specimen.

16,928. (*Chairman.*) Have you always plenty of water to work the water blast?—We have not perhaps sufficient always, but we endeavour as far as we possibly can to have sufficient.

16,929. Does it run shorter in summer?—Not often; they are generally ever-running springs.

16,930 But it does sometimes run short?—A little

16,831. In winter does not it sometimes freeze?—We try to prevent its freezing; we cover it over.

16,932. But it does freeze sometimes, does it not?—Not often.

16,933. (*Mr. Holland.*) Is it stopped by frost sometimes? I do not know that it is; we cover it over and have a close conduit, so that that the frost cannot affect it.

16,934. How long have you been a miner?—I have been connected with mines as a working man and in the capacity that I am now in, 45 or 46 years. I went underground at 14. I was for 22 years a pickman, and I have been nearly 24 years an agent.

86,935. Are you convinced that much more attention is paid to ventilation now than was paid to it when you began?—There is no comparison; the mine is not like the same sort of work.

16,936. As regards ventilation?—Yes.

16,937. In what other respects has it been much improved?—The water blast has been of great benefit.

16,938. About when was that introduced as a general thing?—As nearly as I can tell, from 35 to 40 years ago.

16,939 Has it become much more general now than it was 20 years ago?—It is quite general now; when I first began as a working man there was no such thing as a water blast in the country.

19,940. Can you drive such a level as we were in to-day without a water blast?—No; except by means of a fan blast.

16,941. A water blast or some other equivalent?—Yes. For a temporary purpose we sometimes make use of the fan blast where we cannot have water.

16,942. Do you consider the water blast, where you have a sufficient supply of water, one of the best modes of artificial ventilation?—Yes, as far as our experience goes; we have tried the fan blast and the pumping.

86,943. What is the great advantage in the water blast?—The purity of the air. When we have a fan machine it is generally worked by boys, but the water blast goes perpetually, night and day, weekday and Sunday.

16,944. Can you depend upon the continuance of the water blast more than upon other means?—Yes; it is a certainty.

16,945. Would you prefer a water blast to a fan worked by water;—I think that we should; we have tried both.

16,946. Would a water blast, from its great simplicity, be less likely to get out of order than anything else which you use?—I think so; because it is not so complex as a fan; nothing can be more simple than the working of the water blast.

16,947. Then where you have a sufficient fall and a sufficient quantity of water the water blast would be your favourite?—Yes; and I think that that is the favourite with all.

16,948. Have you considered that the miners have been more healthy since the use of the water blast?—Yes; most decidedly.

16,949. You think that it has kept them in life for some years longer?—I should say so.

16,950. Has it considerably diminished the quantity of dust which the men have to breathe by driving it away?—I suppose that it must do so; it is taken away just as smoke is taken away.

16,951. Has it not diminished the quantity of smoke which they have to breathe more than the quantity of dust, the smoke being lighter; does that correspond with your observation?—I think that it does; excepting where we have shale we have very little dust; in the shale they work a good deal with the pick, which creates dust.

I6,952. Is the dust from the shale light enough to be carried away quickly by the water blast?—A great part of it will fall, but the lighter particles will be taken away by the blast.

Mr. Adam Barker, Whiteside and Summer Lodge Mines.

17,043. (*Chairman.*) Why was the air so bad in that end?—For want of ventilation. Another opening to bring us fresh air to it.

17,044. Then some artificial mode was necessary to bring the air till you got the rise driven?—We had none. We had no communication whatever with any other place to get a draught.

17,045 You had no fan or other mode?—We had no fan in that place

17,046 How long ago is this?—It would be 30 years back. It is 29 years since I commenced it, I believe. I was in it four years. Lead was very low, and wages 7*s.*, 8*s.*, and 9*s.* a week only.

17,047. Was not the system of having a fan worked by a boy in use at that time?—Yes; but we had not one there. It was a long way from the shafts; it was at the east end of the field.

17,048. Do you suppose that anybody would now attempt to drive an end without having some artificial means of ventilation?—No, they have quite a different mode altogether of working.

17,049. At that time was there a low horse level, or did you descend by shaft?—We descended by shaft. Nearly all of the workings at Surrender were by shaft. Mr Robinson got possession of Surrender mines and put up a level out of Arkendale, and they boled to the very level that I am speaking of

17,050. Does the opening up of that level give sufficient ventilation without any artificial means?—Yes, I think so. It has been very beneficial.

17,051. Would it be sufficient to drive a rise on the forehead without any artificial ventilation?—No; it could not be done for a very long distance. The furthest that I ever knew was at Whiteside; we drove about 350 fathoms, and we had a single air place—a single rise that gave us fresh air, and after that we drove about 200 fathoms in the vein, and then we put up a rise 27 fathoms in grit and plate.

17,052. Have you now ventilation completely at the end?—We are out at the surface at that place by rising.

17,053. In driving in a maiden or new mine you are subject to the want of sufficient air?—Certainly.

17,054. More, perhaps, than in an old mine which has a horse level?—Quite so.

17,055. What means do you adopt in the mine of which you have charge where you are driving beyond a rise?—We put up a rise to give us air.

17,056. But if you wanted to drive beyond the rise what means would you adopt for ventilation?—We should adopt a machine, what is called a windy king, that is a fan with a boy to drive it.

17,057. Is that quite sufficient?—Yes, it answers very well in general. We did not use that in our place. I drove a very good level, and I got a door made to fit the end of my waggon, such a one as I never saw tried before in any mines, and I never heard of it. I named it to Mr. Robinson, of Richmond, and I had it attached to the waggon. It was a very good level, and the men carried it with that velocity that it drove a current of fresh air which it carried into the fore-head.

17,058. (*Mr. Holland.*) How did the air get out?—I do not know how it came, but they always had plenty of air.

17,059. (*Chairman.*) I suppose that this board did not fit close to the sides?—It did not. They came back with the same velocity. It answered beautifully; it is a most excellent thing. Mr. Robinson admired it.

17,060 I suppose that you could always put it to a certain extent; that is to say, a solid screen in the front of the waggon of the proper size, and that would be an advantage?—Yes.

17,061. Was this straight, or were there any curves?—There was very little curve indeed.

17,088. (*Sir Philip Egerton.*) When you come to any hard material now, such as you have described in Surrender Mine, do you still work it by craft or by wedges, or by blasting?—It is forced to be worked by craft; we cannot do it otherwise.

17,089. You cannot get the shots bored?—We cannot get the shots to work so well without they have liberty.

17,090. But the ventilation is provided for now, whereas it was not provided for heretofore?—It is a great deal better provided.

Mr. Thomas Coates, Arkendale and Fell End Mines.

17,273. (*Chairman.*) Do you know how many of those are in direct communication with the level?—I can go in at Danby level and come out at Danrigg level, and go in at Danrigg level and come out at another level, and so from one to the other.

17,274. Is [there any particular up-cast or down-cast?—We have sunk a shaft at the Foregill level; there is only one.

17,275. Is that an up-cast or a down-cast?—It just changes as the weather changes. If it is going to be droughty weather the air will go out at the mouth, and in wet weather it will be the contrary.

17,276. What is it in very hot weather?—It draws out at the level mouth.

17,277 Then there is a time when the air is stagnant?—Very seldom. I never recollect it when there has been a thoroughfare in that way; there is more in windy weather.

17,278. When you have been driving a forehead, have you been obliged to adopt any artificial means for ventilation?—Yes, we use every means that we can; we have windy kings and water blasts.

17,279. Does the water drive a fan, or does it act as a blast in itself?—We have tried both ways.

17,280. Which do you prefer?—I prefer having both of them together: having a fan inside the water blast, the tub and the air likewise, because the air beats on top of the fan and carries it. We have tried it two or three times, and I have always found a stronger current when both were going together.

17,281. When you have a windy king you are entirely dependent upon a boy?—Yes.

17,282. What security have you that the boy does not go to sleep, and that he continues to drive the fan?—We always take the fan close up beside the men, and we suck the air in that case; the boy is sitting within a certain number of fathoms of the men.

17,283. So that the men can then look after the boy?—Yes. I have been a miner myself for about 30 years, and I principally worked in the close fore heads. I had a good deal to do with these boys, and I have known one put his finger in, being perhaps half asleep, and when we came up to him he was crying out: it was suddenly crushed. This is about 20 years ago. He happened to be at a sumpt. The sumpt was about 15 fathoms; it was rather inconvenient, so that after that we contrived to have the boy beside us, so that if he did not blow we could go and make him blow.

17,284. In your opinion it is better to adopt that mode than to have him several fathoms off at the end?—Yes.

17,338. In Danby you depend upon the cracks for ventilation, do you not?—Yes, and the Old Man.

17,339. Is Stang another portion of your mine?—Yes.

17,340. Which is the worst part for ventilation?—We have no part which is bad.

17,341. Which do you think is the worst?—I think that we are as badly off at Danrigg as at any place, and there we expect to hole into the Old Man directly.

17,342. But till you hole into the Old Man you depend upon the windy king?—Yes, and a trap door, as we call it.

17,343. What is the trap door?—We put in two cheeks, and it is made air-tight, when you take hold of it it will send in a draught like a bullet.

Sir George William Denys, Bart.

17,359. (*Chairman.*) Have you seen any difficulty in ventilating any of the mines with which you have been connected?—Until a mine gets opened, of course just at first, when you drive a single level you can go 100 or 150 fathoms, or 200 fathoms without any great difficulty. Then of course, unless you are going to make a rise to the surface, or to connect this level with some other level which happens to be above you, you must bring your air in by some artificial means. We generally use air troughs or a water blast.

17,360. What is called a windy king is worked by a boy?—I do not know anything of that term here, it may be a mining term, it is probably a local term.

17,361. Are these machines worked by water or by hand?—Both, sometimes one way and sometimes another, but whenever we can get water power of course it is preferred, because you have not to pay for it.

17,362. Does the water turn a fan, or does it convey the air by a blast by pressure?—Generally by a blast.

17,378 (*Mr. Kendall.*) As far as you can judge whenever you have a long way to drive before you communicate with the surface or some shaft, the appliances of machinery, and so on, are always effectual?—Yes. In fact, the men would not work without it, they would strike.

17,379. Supposing a man is in the least affected by it, would he complain at once?—Yes; and then the masters

(Cn.) *Ventilation.*

would immediately put in a rise to get air into the place as fast as possible.

17,380. And during that time he would be quite sure to have all the appliances necessary for air?—Yes, until the rise is completed the men are working in a confined atmosphere; till a communication is made the men more or less suffer during the time of their working.

17,381. But at the same time everything is done to alleviate that suffering?—Certainly; it is to the interest of the masters as well as of the men.

17,395. (*Mr. Holland.*) Are you able to get as good ventilation by fan as by hooling?—I do not understand what is meant by hooling.

17,396. But during the temporary arrangement the air is bad?—Yes; we do not get enough of it.

17,397. Would it not be worth while to have larger fans?—The companies are anxious to do things as economically as they can, and they would not be at the expense of putting in an expensive fan for perhaps a few weeks or months, when on getting to a certain point the mine would be ventilated in the regular way.

17,398. Are you satisfied that it would not pay to do so; is not the loss of wages in bad air very great?—No, I do not think that it is. They manage it by giving the mine a certain number of hours to get clear of smoke. Of course, there is loss of time, which is loss of money.

17,339. A larger fan would avoid that, would it not?—Yes; the water coming out of the mine would keep the thing going; the levels are generally at the bottom of gills, and there is invariably a heck in the gill. I have been in all directions, and never except just in the forehead of a level have I felt the least want of air

17,403. (*Sir Philip Egerton.*) Is there a good deal of iron pyrites in the black plate?—Yes; we dislike that exceedingly. There are no noxious exhalations here like what there are in the coal mines.

17,404. (*Chairman.*) Have you not carbonic acid gas sometimes?—Not that I am aware of.

Mr. Robert Daykin, Hurst Mine.

17,419. (*Chairman.*) Do you depend for ventilation a good deal upon the fissures?—No; principally in that level, by shafts.

17,420. The Old Man's workings?—These are useful for ventilation when open; we have not those, we make new ones for that purpose.

17,421. But there are swallows in your mine?—Yes; the Commissioners saw yesterday a very great one, in Pryes level especially.

17,422. Does the air come down the swallows?—Both ways sometimes.

17,423. Water comes down the swallow sometimes?—Yes, that swallow has taken 140 gallons a minute, it is a regular fissure in the 12-fathom lime.

17,424. That helps to ventilate it considerably?—Yes; but we have a shaft there as well, called East Close shaft, and many sumpts therefrom, and that convey wind underneath that level, and we put up rises to ventilate it completely.

17,425. There was one part where the candles did not burn?—That was when the Commissioners were down. At that time the great Swallow was overset, and the lower way-gates there flooded through the wet weather, which prevented the pure air either coming on them from East Close shaft or Swallow; but as soon as the rough weather abated, the water therein passed off; wind came.

17,426. (*Mr. Kendall.*) The water had risen there?—Yes.

17,427. And that prevented the circulation of air?—Quite so; it was during that wet weather.

17,428. (*Chairman.*) Have you seen that happen before?—It happens occasionally; but it is generally in extreme weather when there is a great deal of wet or anything of that sort.

17,429. That stops up your fissure, which is your means of ventilation?—Yes; but there are some shafts further west which we intend to open out as we go along.

17,430. But till you get to those shafts you may be liable to that stoppage?—Yes; but it will not be long before we get to them. There are, however, means of getting air by a machine, which we now use.

17,431. That you call a windy king?—Yes.

17,432. That is worked by a boy, is it not?—We have one driven by water and another by a boy, that is to say, when they are wanted, but not always.

17,433. When it is worked by a boy, where do you put him?—Generally at the side of the level.

17,434. That is at a considerable distance from where the men are working?—Yes; it is always at a considerable distance; we put him where there is good air, and convey it in wooden boxes.

17,435. The boy forces the air on, but he does not draw it on?—He does not draw it on, but forces it on; we can do it both ways by these hand machines. We do not use any boys at present. It is pretty well ventilated.

17,447. How long is it in blasting before the powder reek gets away?—It varies. I have seen it stay a long while, and I have seen it pass away immediately where there is a good current of air.

17,448. But where there is not a current of air it is a long time?—Yes.

17,449. How long?—It varies; sometimes it passes away in an hour, and sometimes it takes six hours.

17,450. And where it does not pass away quickly it affects the men?—Yes.

17,451. Have you ever any carbonic acid?—Yes, especially in the lower workings.

17,452. Do you come upon it suddenly, or is it from accumulation?—I have known it accumulate, especially from change of weather, and when the weather has changed again I have known it all to have passed away.

17,453. (*Mr. Holland.*) Do you mean a change of weather checking the draft?—Yes.

17,454. (*Chairman.*) How do you know that it is carbonic acid?—I have known it because the candle will not burn. It is well understood to be there. It is called choke damp with us.

17,455. Have you observed it low down or high up the level?—It has been in all places where there has not been a free circulation, and especially where there has not been a double way-gate.

17,456. Have you ever seen it come out of the rock?—It will come out of all fissures. I have found air come out, and most likely it would be mixed with carbonic acid as well.

17,457. Have you ever seen it put the candle out when you held it to it?—I do not know that; I have never noticed that in the lead mines.

17,458. I suppose that the candle is the only means which you have of judging?—There are other means of judging in the mines. The cautious miners can soon tell. It will affect their limbs and cause a drowsiness and lassitude: it affects their head.

17,459. Do the men come out at once when they find that to be the case?—Generally when the candle will not burn they are obliged to come out, they cannot stop long in it; but that soon passes away when there is a draught.

17,460. Do you use zinc pipes?—We have not any in our mine, but they are used. We use wooden boxes four inches by six, and they carry wind pretty well.

17,464. Have you ever found any effect from the decayed timber?—I have found effects from the decayed timber, and especially where there is not a free circulation, you will find a sourish smell of carbonic acid, and a taste as well.

14,465. Do you think that there is any accumulation where the Old Man has been?—No, not much. When there is a free circulation that passes away; but you can never ventilate where the way-gates are driven in plates so well, because they are not so porous as other strata.

17,466. The plate is generally the worst, is it not?—Yes.

17,467. Is that from the dust?—No; not so much from the dust, but from crumbling. It seems to crush and crumble, and fills up the place, consequently you cannot keep those way-gates so long open as you can with stone, because, generally, rock is full of fissures, and plate is not so.

17,468. (*Mr. Holland.*) Have you known it fill up the way-gate behind you entirely?—No; but if you have a double way-gate for ventilation it will crumble, but you must keep open your main way-gate where you work at, whatever expense it may be.

17,469. (*Chairman.*) If an old working or way-gate has been left for ventilation, unless it is arched, if it is through plate, it will fill up?—It will.

17,470. And will, therefore, stop that means of ventilation?—Yes.

17,471. This mine has been a poor mine for some time, has it not?—It has been poorish for some time.

17,472. I suppose that in a mine yielding a good return many improvements could be adopted which you cannot adopt in a poor mine?—Yes. Sometimes we are led to carry our leading foreheads a long way from our air shafts; the wind is conducted in wooden boxes, but if the mine had been paying we should have made a new air shaft near to the forehead. But sometimes when things are poor, you do not carry everything up to the mark as you would do otherwise.

17,473. (*Mr. Holland.*) You say that the timber in the mine decays very much?—Yes.

17,474. Much more than in the open air?—Yes, except where there is a great deal of water. It is what we call the dry rot.

17,475. It is fungus, I suppose?—Yes.

17,746. Does it decay much more in some parts of the mine than in others?—Yes.

17,477. Is that affected by the ventilation?—I think so, especially in dry places; it decays very much.

17,478. In dry places with bad ventilation?—I do not know exactly as to the ventilation. I have seen good ventilation in dry places, and the wood has decayed.

17,479. You have not noticed whether the amount of ventilation in different parts of the mine affects the timber very much?—I have not exactly noticed that, but especially where there is a great deal of water the timber will last longer.

17,480. You say that you know that there is carbonic acid in the mine because it puts the candle out?—Yes.

17,481. But the poor air will put the candle out, will it not?—We have never to contend with anything in the mines but carbonic acid and smoke from gunpowder used in blasting.

17,482. Have you noticed that that gas is more at the bottom of the level or at the top?—Always at the bottom.

17,483. Very markedly so, the candle will burn at the top, but not at the bottom?—Yes. When we have it it will burn better at the top than at the bottom.

17,484. Is the dust in the mine so much as seriously to affect the men?—Where it is a dry place perhaps it might, but I have not heard men complain very much about dust. It is chiefly from want of pure air.

17,485. Chiefly of poor air?—Chiefly of pure air.

17,502. (*Mr. Kendall.*) Some time since there was very bad ventilation in consequence of the rise of water?—Yes.

17,503. Did it ever happen to be so bad before?—It might, I do not remember it.

17,504. That is the only instance during your agency that you recollect bad ventilation in the mine?—I have seen other mines as bad or even worse, but this water was an influx during wet weather, as I said before, but that part of the mine you perhaps refer to, viz., Pryes level, has only been in working during the last three years of my agency.

17,505. And it does not occur frequently?—No, I should say not above once in a season. We have a shaft which ventilates the whole independently of the swallow, it is to ventilate the mine independently of everything.

17,506. (*Chairman.*) Is that shaft up-cast or down-cast?—It depends upon how the wind blows.

17,507. (*Mr. Holland.*) Whether the wind blows up the adit or not?—Just so.

17,508. (*Chairman.*) Have you ever thought whether it is advisable to make it constantly an up-cast shaft?—We can do so, it is a matter of no consequence which way the air passes, we don't suffer much from the want of air there.

Mr. Francis Taylor, Old Gang Mine.

17,534. (*Mr. Kendall.*) The ventilation itself would not at all interfere with the dust in the workings?—No, not in the close workings, but by machines we can work with better air.

17,545. (*Chairman.*) How long is the powder smoke getting away?—It is not very long in some places, a great deal depends upon whether you have wind or not.

17,546. When you have the windy king going, how long is it?—You can blow it out in a quarter of an hour or twenty minutes.

17,554. Should you say that that part of the mine was not so well ventilated as the rest?—I should say that it is better ventilated, because the air can go through in the old workings anywhere.

17,555. Is there any one particular shaft which is the up-cast shaft?—Yes.

17,556. Is it always that?—It does sometimes change, it will change in summer with a drought or a change of weather, or something of that kind. The deepest shaft which I showed the Commissioners is generally an up-cast shaft.

17,557. But in some weathers it will change?—I have known it to do so, but very seldom.

17,558. Have you ever had a place in which men have been working there lately, where the candles would not burn well?—No, not lately.

17,559. But I suppose, in your experience as a miner, you have known that to be the case?—Yes.

17,560. What does that arise from, in your opinion?—Scarcity of air.

17,561. Not from carbonic acid gas?—Those are terms which I do not exactly understand.

17,562. Have you seen the candle not burn well when it has been held up near the top of the level, or at the lower part of the level?—I know that there is a difference.

17,563. (*Mr. Holland.*) At which part has it burned best, top or bottom?—It has burned best at the top.

17,564. Always?—Not always.

17,565. Does it ever happen that when you lower the candle it goes out quite suddenly?—No, not in workings which we have now; but I have seen it formerly where it has died out blue.

17,566. Just as if you put it into water?—Yes.

17,567. What does it cost to work a blower?—The boy who turns it has 8*d*. a day.

17,568. Is the expense of that blower saved in the saving of the men's labour who are supplied with air?—The company pays that.

17,569. But do the men work better for it?—Yes; you may say twice over.

17,570. It is more than twice over, is it not?—Yes, I should think so.

17,571. (*Chairman.*) The company pays the boy?—Yes.

17,572. Where do you put the boy to work the machine; do you put it near where the fresh air is, or do you put it near where the men are working?—We put it not quite to where the fresh air is, and we have pipes back into it and pipes forward.

17,573. How far should you say it ought to be from where the men are working?—Some persons prefer its being very near, but that is very unhealthy for the boy: we never carry ours so near. I should think that where we were up yesterday it was about 28 fathoms off the men, and some 6 or 7 fathoms off where the fresh air went.

17,574. How can you be sure that the boy will always keep working?—The men can tell that by hearing whether the machine is working, and putting the candle to the pipe end; when they are feeling rather scarce of air they will give him a tap at the pipe, and it comes very soon to him, and he goes on working it.

17,575. Have you ever tried a water blast in that mine?—Yes.

15,576. A water blast, or to turn the fan with water?—A fan will carry a stronger wind if it be near, but a water blast is regular, and will blow a long way.

17,577. You prefer a water blast?—Yes, for a mine which has to be wrought a long way off. I should think that we drove as long a cross cut on our field as has ever been driven by the water blast.

17,578. How many fathoms?—I should think 300 fathoms.

17,579. With what sized pipes?—I should say four inches or four and a half in diameter.

17,580. Made of zinc?—Yes.

17,581. How long do the zinc pipes last?—They do not last very long in some situations, they corrode and wear in holes where the water drops, and where they come in contact with holdfasts; we leave them under holdfasts; when that happens a new one is put in.

17,582. (*Mr. Holland.*) You mean an iron holdfast?—Yes.

17,583. Do not you hang them by leather?—No; we put them upon an iron crook, and a piece of wood to keep them off.

17,584. (*Sir Philip Egerton.*) How long before we went up the stemples yesterday had the shots been fired?—The men heard of our coming after they had fired the holes.

17,585. (*Mr. Kendall.*) We were up within 20 minutes?—Yes; we stayed nearly 20 minutes sending the men up to return the work down.

17,586. No, were not so long as that; the men said a quarter of an hour; and I think that we must have been in within 25 or 30 minutes after the blast?—Yes, I think so.

17,587. (*Sir Philip Egerton.*) Did it not happen that the strap of the windy king broke while we were there?—The strap broke while we were there.

17,588. So that if the windy king had been in working order, the smoke would have been more cleared away than it was?—I should say that it would have been near about clear when we got to the top.

17,589. The candles burnt quite clear when we were there, notwithstanding?—Yes; I believe that if the strap had not broken you would have seen very little smoke; the boy was turning it when we got out of the waggons, and when we went by him it broke.

Mr. Thomas Raw, Surrender Mine.

17,622. (*Chairman.*) Are you troubled at all with the dust in the Surrender Mine?—Not much; it is well ventilated, and free currents of air pass generally through our workings, having a good up-cast shaft.

17,623. Is it always an up-cast shaft?—Yes, except in dry weather. The men take it as an indication of its going to be dry weather when it it is down-cast and the air draws out at the level.

17,624. To a certain extent the air is stagnant when that change is taking place?—Yes, just for a few hours, at the time of the change, it is reversed in its course.

17,661. Where you have to employ artificial ventilation, which should you say was the best means?—I like the water blast the best when you have water power at your own place, a water blast being more serviceable.

17,662. Which would you think best, driving in air or extracting it?—We have tried both ways. I think that it is well, where you can, to form a vacuum, and the good air will then pass forward and fill up that vacuum. We had a long rise at Surrender for 30 fathoms, and we had no air but what we forced up, and as soon as I put water into the water boxes and brought it to the end of the 30 fathoms it forced all the foul air out; the good air rushed up the rise and we were well supplied, the water falling the 30 fathoms it had great power, and brought all the foul air out

17,663. (*Sir Philip Egerton.*) Have you ever tried furnaces for rarefying the air?—No.

17,664. The cost of fuel, I suppose, would be too great?—Yes. Our shaft is a regular up-cast one, except in certain seasons, as I tell you, and you can see it smoking out as you pass by.

17,665. (*Chairman.*) If you put a fire in it, it would make it a constant up-cast, and a greater up-cast, you have never tried that?—No. In fact we have had no need of that in our shaft. There is quite a sufficient current of air, so that you could sift wheat from the chaff very nicely, and blow your candle out.

Mr. John Knowles.

17,702. (*Chairman.*) Do you reside in this neighbourhood?—About four miles from here up the Dale.

17,703. You are connected with some of the mines?—Yes; I am connected with Arkindale, Old Gang, and Beldihill.

17,704. Are these mines all entered from the level?—Yes

17,705. You consider that the best way?—Yes, both for ventilation and for getting the work out.

17,706. And getting rid of the water?—Yes.

17,707. Are all these mines connected with the Old Man's workings?—Yes.

17,708. I suppose that it facilitates the ventilation?—Yes, very much.

17,709. Are these shafts of the Old Man's used for ventilation as up-cast shafts and down-cast shafts?—Yes: they are principally up-cast shafts, but the air goes in at the level.

17,710. Does it vary at all with the weather?—Sometimes it does a little in summer, but very seldom.

17,711. Have you ever seen a plan of having fire or anything in the shaft to make the draught stronger?—Yes, in the coal pits.

17,712. But not in this district?—No; we have no occasion for it.

17,713. I suppose that the difficulty in ventilation comes when you are driving a forehead?—Yes; that must be pushed forward, and we ventilate it with pipes.

17,714. Then you have to employ artificial means?—Yes, either by a water blast or by fans blown by hand; and then when we get to a workable vein, we air it by communication with a rise up to the day.

17,715. I suppose that in new and trial ground, or maiden mines, it is more difficult to get ventilation?—Yes. In working a vein in new ground we generally have our horse level forward of where the men are working at ore above, and we carry a way-gate above the horse level, and we keep it open, perhaps every 50 or 100 fathoms, we put up rises from the horse level, and we carry our wind forward in that way.

17,716. Most of the workings are above the horse level?—Yes; we always contrive that if we possibly can, and then the work comes down hoppers instead of having to lift it. Sometimes it may be five fathoms higher, or it may be 20. It just depends upon the strata that we are in.

Mr. George A. Robinson, Grinton Moor Mine, &c.

17,793. (*Chairman.*) And also it is the best means of ventilation?—Yes, the water blast. At one place in Old Gang a cross-cut of between 300 and 400 fathoms was aired entirely by a water blast.

17,794. A water blast is the best means of ventilation?—Yes, the best which we have; we have nothing to be compared to it.

17,795. Which do you think is the best means of ventilation, the driving in air, or extracting the foul air?—Are you speaking of a leading forehead or anything of that kind; do you mean when we are driving an adit in a leading forehead?

17,796. Yes.—I should drive out the air; I would make an alteration in the way that it is generally done. I would have my machine with the water blast placed in the forehead, and not at a distance from it, and I would have a double way-gate to force the air out in that way: I mean a double way-gate for the air, and not for the men. I would have it bratticed off a little bit.

17,797. Then you must make your level either wider or higher, must you not?—No, I do not think there would be any occasion for that. We tried it in one place. I would conduct it by means of wooden troughs or launders; I would fix that, according to the nature of the air, either at the top of the drift or the bottom; I would conduct it where there is choke at the top.

17,798. (*Mr. Holland.*)You mean a wooden air pipe?—Yes; I should like to see all our way-gates made higher. In the two chief levels which we put on lately, instead of carrying them six feet we carry them eight feet now, and from five to six feet wide, and we find that our mines are aired better, and that the men can work them cheaper in that way than they could before. We meet with so many more flats in working them in that way.

Mr. Thomas Edmundson.

17,942. (*Sir Philip Egerton.*) In your long practice do you think that you can trace any amelioration in the length of the life of the miners?—No.

17,943. Has there been no amelioration in the ventilation in the mines, for instance?—They have taken a great deal more pains to keep the mines ventilated by conveying air and conveying water and other things there to get a full quantity of oxygen in.

17,944. Has the result of that been an improvement in the health of the miners?—Yes. When I have attended them where the air was bad I have generally recommended them, and wished them to carry in some quicklime and and spread it on a board or on a tray, and it seems to absorb the carbon and form carbonate of lime (chalk); and, of course, if it did that it left more room for other gases; and I think that it is a very good thing.

17,945. Is there much carbonic acid gas generated in the mine, or is it merely from the absorption of the oxygen?—It is more from the men breathing, and not having a quantity of oxygen to take off the carbon.

17,946. Are there no beds which give off noxious gases in these mines?—I do not think that there are any here.

Mr. Jonathan Coatsworth, Keldheads Mine.

17,973. (*Chairman.*) How far is the end of the air course from the forehead where the men are working?—It is about 15 fathoms; and at the end of every 20 fathoms I put up a rise.

17,974. (*Mr. Kendall.*) When you get in about 19 fathoms, before you have your rise, what is the general state state of the air?—It is not bad 19 fathoms from where there is a good current; the men take no harm if it is only 19 fathoms and a good level.

17,975. You communicate at every 20 fathoms?—Yes.

19,976. Just before you communicate is the air very bad?—It is not.

19,977. Do you use any artificial means to throw the air just before you communicate?—At Keldheads we have a water blast driving regularly.

17,978. (*Chairman.*) But not in that level?—Not in this level; it is a new place, and we have never yet found the necessity of having one.

17,979. You depend for the air there upon the air drift?—Yes.

17,980. It is a narrow vein in which the men are working?—Yes, but they take the main level four feet wide and six feet above rails; and it is not a little place.

17,981. What is the size of the air drift?—Six feet high by about three feet wide. The vein is generally about two feet wide, and we make that drift about three.

17,982. There is not a strong current of air at that point where the air drift is brought out?—Not very strong; it will draw your candle gently away.

17,989. Will you describe the water blast?—It is simply a column of water in iron pipes, and at the bottom of the pipe a small hole is drilled about a quarter of an inch in diameter, and it will not spread much more than the breadth of my finger as far as the window, and that drives a current of wind into a cistern. We have that cistern so constructed that the water falls out at the bottom and the air passes into the pipes at the top; the pressure will not allow the air to get back, it goes forward.

17,990. It is a very strong blast?—Yes; the air cannot get back, it must go on. I consider the blast to be very good.

17,901. What is the size of the hole?—About a quarter of an inch, and with 16 fathoms of pressure, a strong current of water passes through it.

17,992. (*Mr. Kendall.*) What is the size of your pipe?—Five or six inches in diameter, and the jet is about a quarter of an inch as near as I can say.

17,993. (*Mr. Holland.*) Do you know the quantity of air which it drives in?—No, I cannot say that.

18,070. (*Chairman.*) Is the air shaft always an up-cast shaft?—Ten or eleven months out of twelve it is; in very dry weather in summer sometimes it draws down.

18,071. And then, till the current has changed, the air is not so good?—Not quite so good for an hour or two while that change is passing.

18,072. Supposing you put a fire at that air shaft, could not you ensure its always being an up-cast?—Yes; I expect we could.

Mr. John Tattersall.

18,079. (*Chairman.*) You consider that the Kelsheads Mine is now well ventilated?—I think so. We took every pains during the time that I was with them to have shafts to the top, and double roads and double air ways, and trap doors, and double sumpts. With the first sumpt which we had, before we communicated with the next one, we had some trouble in driving air down with a fan and those things, but when we had once got a communication and carried a double road, we never suffered much afterward.

18,080. There is an up-cast shaft?—We always had an up-cast shaft.

18,081. Is that affected at all by the weather?—Sometimes the air will go up the shaft and sometimes it will come down it.

18,802. Would it not be advisable if you could always secure its going up the same way?—I think it would be better, but I do not know how we could manage that.

18,083. If there was any furnace at the shaft, do you think that that would do it?—Perhaps a furnace might draw the air, but when it comes down I do not see a very great deal of difference.

18,084. That is only, I suppose, during the time when it is changing?—When we are going to have a fit of very bad weather, sometimes the air will hang heavy in the mine, though there is a current, it seems to be a heavy atmosphere there immediately.

18,093. (*Mr. Holland.*) You have said that the ordinary up-cast shaft occasionally becomes a down-cast?—Yes.

18,094. Is that in the hot weather?—I think it is generally when there is going to be a fit of wild weather.

18,095. Is it changed by the direction of the wind?—No; I think that it happens when the wind is in all parts, sometimes.

18,096. Is it changed by hot weather?—I have found it generally when it is going to be very wild weather. When I have made these observations I have generally found it so. Sometimes the wind is then driving from different quarters.

18,097. You have not discovered the immediate cause of the change?—No.

18,113. (*Mr. Kendall.*) Take Grassington; do you think that the mines there are as well ventilated as they are here; did you go under ground there?—Yes, at different times, but I thought that they were not so well ventilated as we have them here, and they work in grit there, and it appears to affect the men very early. The dust appears to get on to their lungs, and their wind is bad.

18,114. Then you attribute the difference to the grit, and not to mode of ventilation?—I think it is the grit; the mines are dry and very dusty in the grit; they are generally hard veins.

Mr. Matthew Newbould, Sunside Mines, &c.

18,143. (*Chairman.*) Do you use any artificial means such as fans?—We have fans and zinc pipes mostly for blowing.

18,144. Are those blowers supplied with air by a machine worked by hand or by water?—Mostly by hand work.

11,145. You have no water blast?—Not at present; we occasionally use them in some parts of the mine, when we require them.

18,146. At present how long should you say that in any one forehead the smoke is getting away after blasting?—It will be away in five or ten minutes. Of course, it depends upon the air, how near they are to an air way.

18,147. (*Mr. Holland.*) That is about the usual time, is it?—It will vary a little; it will be from five to ten minutes, some will be longer and some shorter.

18,148. (*Chairman.*) Will it ever be as much as an hour getting away?—No; not in getting away from the forehead.

18,149. How many men generally work in a partnership?—Generally four.

18,179. (*Mr. Kendall.*) What is the length of the most distant forehead which you have from good air; you have two levels a mile and a half long, take the end which is the furthest from good air?—I think not more than 100 yards, we have only one which is that distance. We have some a good deal nearer.

18,180. Have you a fan there for it?—No, we do not require it, we have a double way-gate; this is a top level. We have another rise from a horse level which makes a communication of air.

18,181. But still your end is 100 yards from that communication?—Yes.

18,182. Do you find the air bad at all there?—It is duller; it is worse when the men give up working. There are two men at a time, and they stop about five hours.

18,183. Have you any intention of ventilating it better?—Yes; we shall open a shaft from the surface.

18,184. How many fathoms is that?—About 40 fathoms from the surface.

18,185. Why have you not done that before; is it because of the expense?—No, we have not required it; but now we see that we shall have to do it.

18,186. Have you commenced as yet?—No.

18,187. How many fans are there at work in the mine?—Not more than three or four, and those only occasionally.

18,188. Then if you do not use a fan here, where you do use a fan the air must be still more dull?—No; we place it where the air is very good, and take zinc pipes from thence; it is of no use blowing bad air back again.

18,189. But you do not blow any air into this forehead which is furthest off as yet?—No, we do not require it; the men can work without it.

18.197. How do you ventilate at the 40 fathoms?—From the horse level; we have several sumpts and shafts or pits, down to the 20 fathom level.

17,216 (*Chairman.*) You said that the pumping engine pit was 20 fathoms below the horse level?—Yes.

18,225. Has there been any occasion when the men have had to leave their work from any bad air occurring in the mine?—What we call for want of air?

18,226. Yes.—By chance; but it is very rare that we have anything of that kind.

18,227. In which description of bed is it more difficult to ventilate?—In the shales and grit beds; I think they require a better ventilation than even the limestone does.

Mr. William Barron, Craven Moor Mine.

18,240. (*Chairman.*) How many levels are you driving from the shaft?—We are driving two at present.

18,241. How far is the forehead from the mouth of the shaft?—About 150 fathoms west at 42 fathoms deep.

18,242. How do you get air at that end?—The Old Man has worked it for several years before; it is a very ancient mine, and we hole up into his workings; there are other shafts from different workings, so that we can come out very near any place, viz., Woodhouse shaft, Longthem shaft, Derby shaft, and Cockhill level.

18,243. From these levels you hole up into the Old Man's workings?—Yes; what we call rises.

11,244. What distance do you carry a level before you think it necessary to put in a rise to the Old Man's Workings?—It depends upon the metal; if we have good batches of metal we cut it all out and get the ventilation behind us.

18,255. When you drive by the fathom, how far would you drive?—By using good zinc pipes we can drive 100 or

Ventila-

200 fathoms and sometimes 300, with fans or pressure of water confined to pipes.

18,246. Do zinc pipes decay?—No, I have not found any decay.

18,247. How are the fans driven?—By water wheel generally. None at Craven Moor.

18,248. What do you use?—A trap door.

18,249. What size are the zinc pipes?—From four to six inches.

18,250. And that gives you sufficient air without having a fan?—Yes, for the distance that we drive.

18,251. Where you put the trap door, is the air which is diverted by the trap door from the bratticed shaft or from an Old Man's working; From a level; we have a level which comes in from the Cockhill mines to take all the water out, a depth of 56 fathoms; and we have a thorough communication of air both into the bratticed shaft and the other way. We put a trap door in the main level, and in a change of wind we have it both ways.

18,252. Then I suppose that the up-cast is dependant upon the weather?—Yes; sometimes it draws down the level and sometimes it comes up the level and shaft, and it acts in the same way in the pipes; it is sometimes like a pump forcing the air in, and sometimes it is drawing it out; but the furthest level at present is only 48 fathoms from the trap door of main level.

18,253. And you find the air perfectly good?—Perfectly.

18,254. How do you ascertain that?—By the candle.

18,255. Not in any other way?—No; we never think of anything of the kind; if the candle will burn straight up without slanting it, we consider that quite good and safe.

18,256. Supposing you were obliged to incline the candle, what should you do?—We should leave off for a day.

18,257. Have you ever had to do that?—No, never at Craven Moor.

Mr. Joseph Broad Champion, Merryfield Mine.

18,362. (*Chairman.*) How many levels have you?—Two.

18,363. Which is the longest?—The adit level is the longest.

18,364. What is the length of it?—About 900 fathoms.

18,365. Do you communicate with the Old Man's workings?—We have not opened up the Old Man's workings.

18,366. How many rises have you in the course of that level?—We have three shafts from the surface.

18,367. How far is the forehead from the last shaft?—Merryfield level is communicated with Storney Groves level, and they carry the level forward.

18,368. How far is where you are working now at the forehead from the shaft?—About 20 fathoms.

18,369. Have you any difficulty in ventilation at that point?—No, not in the least.

18,370. Do the candles burn quite well?—Yes.

18,371. How far shall you drive before you put up another rise?—About 10 fathoms further; 30 fathoms we propose.

18,372. You think that you may drive 30 fathoms safely?—We could; but I think that in grit 30 fathoms is quite sufficient for the men to have good air.

18,373. There is more difficulty in getting good air in grit and shale than in limestone?—Yes; I think that there is.

18,374. Since you have been working there, have you ever had occasion to employ any artificial means for throwing in air?—Yes; we opened out the level 600 fathoms with air pipes alone.

18,375. Had you any means of throwing air into the air pipes?—Yes; we had a 40-fathom water blast.

18,376. Did you find it quite sufficient?—Yes.

18,377. What size was the pipe?—Eight inches.

18,378. Was it zinc or wood?—Zinc.

18,379. Does the zinc decay or corrode at all?—Yes; the water did decay it. I suppose that it was sulphuric acid coming from the sulphur which decayed the pipe.

18,380. How long do you think that they would last?—They last a great number of years with care.

18,381. But if they decay at points, the air escapes without coming on to the end, does not it?—Yes; and then we lap it with flannel.

18,382. You have to try it constantly?—Yes; we tried it in fact every day.

18,383. Do the men have extra pipes to carry on to where they are working?—Yes; they keep it on as close as possible.

18,384. How far is the mouth of the pipe generally from where they are blasting?—Generally about two or three fathoms; the pipes are nine feet long.

(C^n^.) *Ventilation.*

18,393. (*Mr. Holland.*) You have said that the zinc pipes frequently decay; is that at the point where they are supported?—No; it is generally where there is a drop of water coming down from an old working.

18,394. How are the zinc pipes supported, upon holdfasts?—Yes.

18,395. Iron holdfasts?—Yes.

18,396. Is there anything between the iron and the pipe?—Yes; flannel.

18,397. Does that last pretty well?—Yes; it lasts very well.

18,398. It keeps them apart for a long time?—Yes.

18,399. Do you think that flannel is as good as wood for that purpose?—Yes; I think so.

18,400. Do you think that it lasts as long?—Yes; quite as long, I think.

Mr. Henry Daykin, Grassington Mines.

18,412. (*Chairman.*) Have you ever had occasion to employ artificial ventilation?—Many times; we are doing that now.

18,413. What means do you use?—In general we use a machine—a fan.

18.414. A hand machine?—Yes.

18,415. Is it a part of the contract that the boy who drives the fan is to be paid by the men?—No; the master always pays him.

18,416. Do you judge when it is necessary or do the men apply to you?—We judge when it is necessary; it depends upon the air; in some places we can work longer without employing artificial air than in others; it depends a good deal upon the sort of ground which it is, whether it is hard or soft.

18,417. Supposing that the men could not get a boy to drive the fan, would they stop their work?—Yes; they could not work without air; we always have boys, and we always get plenty of boys, we have a great many applications to employ boys, more than we can employ.

18,418. At what age do they drive?—Fourteen or fifteen, and so on.

18,419. Does it never happen that the men go on working, and the boy leaves the work?—The boys will sometimes play a bit, and the men have to get them to come back to work many times; they very soon know when the machine stops; boys are boys, and they will play a bit sometimes.

18,420. And leave the machine?—Yes.

18,421. (*Mr. Holland.*) The men find it out in an instant, do not they?—Yes.

18,422. (*Chairman.*) Supposing that the boy left the work, the men would go on working for the rest of that day, probably without him?—They would be very much inconvenienced if they did so.

18,423. But still they would probably do so if the boy had left the work?—Yes; unless it was very bad; if it was very bad they would come away.

18,424. But if not they would continue at work?—Yes.

18,425. Had you any complaint from the men after I inspected the mine, that the boy had left?—No; I do not know that I had. The boy sometimes stops for a few minutes.

18,454. (*Mr. Holland.*) You said that you used fans for driving air in?—Yes.

18,455. Is there any doubt about the economy of using these fans?—We consider them the best of anything here, unless we can bring water to bear.

18,456. Is there any doubt that it is cheaper to drive air in than to let the men be short of air?—It must be cheaper, they could not work in bad air.

18,457. Do you use those fans before the air gets so bad as to affect the candle?—No; it depends a good deal upon the place where we are working; if it is hard ground we require a fan sooner, we cannot go far, but in ground which can be worked with a pick we should go further.

18,458. Is the fact of the candle beginning to grow dim your mark of the want of air?—Yes, generally, and the breathing.

18,459. Do you use a fan before you find it out by the candle?—No, I cannot say that we do.

18,460. Would it not be profitable to do so?—I cannot say; many men would want it when perhaps there is no occasion for it.

18,461. Cannot men do a better day's work when the air is good than when it is poor?—Yes.

(Cr.) *Ventilation.*

18,462. What is the pay for working a fan?—We have two boys now working a machine, one of whom has 1s. 1*d.* and the other 1s.

18,463 Does one boy work as long as the men work?—Yes.

18,464. That is 1s. for the pair?—Yes; 1s. each boy per shift or day of eight hours.

18,465. Are the men of that shift able to earn more than 1s. because of the air?—Yes; I should say so.

18,466. There is no doubt if it is there?—Not a bit of doubt of it.

18,467. Then would it not be well to give these men who wish for more air, the air which they wish for, though it is not strictly wanted?—If they have sufficient air to work with we think that all that is necessary.

18,468. But if they could work better with more air, would it not be more profitable to let them have it?—But I do not know that they could.

18,469. You think that sometimes the men would ask for it when it was of no use at all?—Yes, many a time.

Mr. William Craig, Wensleydale Mining Company.

18,506. (*Chairman.*) Is there more difficulty in working in one strata than in another?—Yes, occasionally.

18,507. In what respect?—We find that in the mountain limestone in this district we can drive and do with half the quantity of fresh air that we can in grit or shale; in grit or shale it requires more fresh air.

18,508. Is there any direct carbonic acid coming out of the rocks in any of those cases?—Yes; up-hill we have a great deal of it, that is at Wearnside.

18,509. A good deal of carbonic acid comes out of the fissures of the rock?—Yes; particularly after we get under the millstone grit.

18,510. Does it come out so that it puts out the candle at once?—Sometimes I have seen it so that it has driven workmen out, and at other times we have sufficient air.

18,511. Is it affected by the weather?—Yes, I should say so, by the little changes which takes place.

18,512. And this finds its way through fissures?—Yes, in some cases; not as a general rule.

18,513. Are the men obliged then to leave the work altogether?—In some cases I have known that they have had to do so.

18,514. What means do you use for remedying it?—If we have a deficiency of proper holes, or proper shafts, or second levels, and so on, we force the air by what we term a water blast, a pressure of water which throws it into a tank.

18,515. You think that that is the best mode?—It is the best mode which I have tried; I do not know of any other.

18,516. When you have shafts do you observe that any shaft is more particularly an up-cast than another?—Not particularly; but when we have these changes of atmosphere our current of air changes; sometimes the shaft sucks down, as we term it, and at other times it draws up.

18,517. Would it not be an advantage to have one shaft as a permanent up-cast?—I think that it would not answer in lead mines.

18,518. Why not?—I think that we should have a pressure to contend with if we forced it one way in these changes of which we have been speaking, that if the air in the shaft was in the course of going down and you were forcing up, there would be a pressure against it—that is according to my experience. I am not aware of any benefit to be derived from it.

18,519. In short, you could not well accomplish it?—It would make no difference whether it goes up the level or down the shaft, because we get the fresh air.

18,520. Is there no stagnation of air at times?—Not in any particular current, but we find the draught sometimes very much stronger than at others.

18,521. When there is a change, owing to the change in the temperature of the atmosphere, are the men aware of it?—No, I do not know that they are; those are matters which they never notice particularly, except they are working at a great distance from a current of air, and then it affects them.

18,522. They would then discover that there was a change in the atmosphere?—Yes.

18,523. How would they discover it?—The air is not so clear.

18,524 Would they discover it by their own feelings or by the candles?—By the candles generally; that is generally their guide.

18,525. When it is in course of changing, the air is for a certain time stagnant, and will affect the men?—It perhaps does not work so quickly.

(Cr.) *Ventilation.*

Mr. Thomas Wiseman, Appletree-wick Mine.

18,543. (*Chairman.*) The Appletree-wick Mine is quite a new mine, is it not?—It is.

18,544. Are you sinking?—No, we are driving a level.

18,545. What distance have you driven?—We have driven it 360 yards.

18,546. Is the air quite good there?—Quite good; we have three air shafts in that distance,

18,547. (*Mr. Holland.*) How far could you drive beyond an air shaft?—We have an air shaft close to the forehead.

18,548. (*Chairman.*) What is the distance between each of your air shafts?—80 yards.

18,549. (*Mr. Holland.*) You drove 80 yards beyond the air shaft?—Yes.

18,550. (*Chairman.*) Before you put up the last air shaft, when you were coming to the part where you put it in, was the air at all close?—No, not at all. The ore goes up to the surface and we take it out, and we keep taking it out.

18,551. (*Mr. Holland.*) It was not only an air shaft but also an exploring shaft?—Yes.

18,552. (*Chairman.*) Have you ever had to use any artificial means of ventilation?—Never.

18,553. Have you got on a good vein now?—Yes, it is a very good vein.

Mr. Thomas Job, Hebden Moor Mine.

18,564. (*Chairman.*) Are you connected with the Old Man's workings there?—It is quite a new field, there are no old workings to speak of. A level was formerly driven before we took on to it, but there were no old workings to interfere.

18,565. What is the longest level which you have driven from the day?—The longest level which goes from the day, which the former company and the present company have driven, is nearly 500 fathoms.

18,566. Are there many shafts communicating with the surface in that distance?—There are two levels from day; there is a level 20 fathoms above the lower one, and there are communications from the lower level to the upper level.

18,567. Are there shafts to the upper level?—No; we sank a shaft, but still it was of no benefit respecting the circulation of air, and it was of no advantage to us in drawing out the stuff.

18,568. So now the ventilation is between the two levels?—Yes.

18,569. Do you find that quite sufficient?—Yes.

18,570. In what strata are you working there?—Sandstone or grit, and shale between the grit. There are two layers of grit, that we call the top grit and the bottom.

18,571. Do you find any difference in the ventilation according to the strata in which you are working?—Yes, we do sometimes.

18,572. Which is the worst?—When we have any great thickness of plate it is not altogether so good as it is in the grit, but there is no great thickness in general, not more than three to four fathoms between the grits.

18,573. Have you ever met with carbonic acid gas?—We have met with foul air occasionally; it depends upon the atmosphere.

18,574. Can you describe any occasion when you have found carbonic acid gas coming out from the rock?—Yes, we have just discovered it where there have been openings, or what we call crevices, in the rock, and it will escape there occasionally; but then it will depend upon the atmosphere outside whether it has any effect or not, as to whether it is any detriment to the men, it will depend upon the point from which the wind is.

18,575. How do you discover it?—By the candles not burning quite so well.

18,576. Have you ever heard it?—We just hear a kind of a singing tone for a day or so sometimes before we should feel the effects of it.

18,577. (*Mr. Holland.*) Hissing out?—Yes; just coming out, that has been in the grit.

18,578. You hear it hissing out of the crevice, do you?—Yes, occasionally.

18,579. (*Chairman.*) Before you feel the effects of it?—Yes.

18,580. Have the men to leave work on that occasion?—They are obliged to sometimes. We never allow them to work in a place where the candles will not burn.

18,581. You judge by the candle whether the air bad or not?—Yes.

18,588. (*Mr. Holland.*) Are these mines as close to work in as the Devonshire mines?—No; they are not so warm.

(C^{a}.) VENTILATION.

Ventila-

18,589. Do the candles burn better?—No; I do not know that they burn better.

18,590. The difference is chiefly as to the temperature? —Yes; and they are not so deep. I have worked in 50 fathoms to 200 fathoms deep.

18,591. Have you any mines here 50 fathoms deep?—Yes, from the surface.

18,592. Did you ever work in any 50 fathoms deep from the surface in Devonshire?—Yes.

18,593. Are the levels 50 fathoms from the surface here as hot as 50 fathoms from the surface in Devonshire?—Yes, I think that they are.

18,594. Is the air similar?—Yes, just the same, I think, when the same thing is laid out for ventilation.

18,595. Is the ventilation as good or as bad as it is in Devonshire?—Just about the same.

18,596. Do you think that the miners are as healthy or more healthy here than in Devonshire?—They are more healthy. A greater heat proceeds from a copper vein and also in the grey slate than in lime, from what I have proved from my own workings.

18,597. Do you see much effect from the carbonic acid which comes out when it is not enough to put out the candles?—No; but there would an effect produced if the men worked in it for any length of time.

18,598. When it is not enough to affect the candles, do you think that it affects the men's health?—I do not know that it does much.

18,559. When there is not enough carbonic acid to affect the candles, does it affect the men in their breathing?—No, not much in breathing; it affects the head a little

18,600. Does it make the head ache?—Yes, if the men continue to work in it many hours; but when it is like that they do not work long.

18,601. Does it ever gather so completely as to put out the candle if you put it at the bottom of the level?—No.

18,621. (*Sir Philip Egerton.*) How many levels have you? —We have two that go in and come out at the surface, but we have three inside.

18,622. In which are you working now?—What we call the low bottom and the middle level

18,623. Do you find any difference in the air in the middle level and the lower level; which is best?—It depends upon the distance which is driven. At this time we have good air in both levels.

18,624. What distance are you working now from the air shaft?—One level is in about 40 fathoms, and the other about 30.

18,625. Is the ventilation natural, or do you use artificial means of ventilation?—It is natural.

18,626. And it is very good in both levels?—It is pretty good.

18,627. Which is the best?—At this time the middle level is best, although it is extended the farthest.

Poor

(a^{n}). POOR AIR.

Mr. Jacob Johnson.

14 (*Chairman.*) Have you long worked as a miner?—Yes; I have wrought in mines all my life.

14,088. In what mines?—I belong to Alston moor; there were only three men at Greenside when I came and it was then but little wrought; I have been a deal in Patterdale, ever since I came from Alston moor, 37 years ago; there were three workmen at Greenside when I came, and I made the fourth.

14,089. Did you suffer at all from any complaint at Alston Moor; I wrought for the London Company, and I thought it was going to injure me; that is, the bad air; and I saw a captain from Greenside, and I told him that I would work with him, and he said that he would set me on.

14,090. Had you worked in bad air at Alston?—A very great deal.

14,091. In what [mine was that?—The mine was called Nenthead.

14,092–93. Is that working now?—Yes; it is.

14,094. Is that a mine belonging to the London Lead Company?—Yes.

14,095. Are there any men working here now who are affected from having worked in bad air?—There are some, but not many, I think. I do not know any that have been affected from working in the Alston Mines. There are not many men from Alston here at present.

(C a^{n}.)
Air.

14,099. (*Mr. Austin Bruce.*) Did you ever work at Greenside?—Yes. There were only three when I came, and I made the fourth.

14,100. How long did you work at Greenside?—I have wrought for 35 years at the Greenside mines. I washed a great deal at Greenside.

14,101. Did you ever work in bad air at Greenside?—Yes; until we holed to the other, between one level and the other.

14,102. How long have you ever been working in bad air altogether?—From my coming to Greenside it was about three years before we got the hole, and got a lead for good air.

14,103. Were you breathing bad air all that time?—Yes; all that time. We had as many as 14 or 16 candles to keep in to get to the work.

14,104. Did you ever find yourself the worse for breathing that air?—No; if it only kept from my knees. It used to affect my knees. I am weak in my knees.

14,105. Did any of the other miners who were working with you suffer from the bad air?—They are dead.

14,106. But did they suffer from breathing the bad air at the time?—Not that I can tell you. They never complained to me any further than I have just told you of, a little weakness in the knees

14,107. Did that weakness in the knees go away when you began to work in good air?—To be sure it did. It just affected the back side of the head sometimes.

14,108. Have you known any men in this district suffer from working in the Greenside mine?—No; I do not suppose there is. I never heard them speak and say that they had suffered anything. There is not such a mine in the north of England that is calculated to have so much air in it as Greenside mine has.

14,109. Do you speak of that mine as it is now or as it was when you were first working there?—It is different now. She was not ventilated when I came to her first.

14,110. You speak of the mine as it is now?—Yes. Until the place be ventilated from one hole to another there cannot be good air. We had no drifts then; only just a close place going in from the day, 40 fathoms in.

14,122. (*Mr. Holland.*) Was the air very bad where you worked during the three years you have mentioned?—Yes; very bad.

14,123. Would the candles burn?—Some days they would, but we used sometimes to have 14 standing back burning? we were watching for fear one should go out.

14,124. You might have been caught in the bad air?—It was to get a light when we wanted it, or we might have been left in the dark; the candles were lying down as back as could be, and when we had one standing in the better air we could go and get a light.

14,125. Did not that cause you perspire very freely?—Yes.

14,126. Did you experience a trembling in the knees while you were so working?—Only then.

14,127. When you came out into the fresh air did you feel all right again?—Yes; but sometimes it just touched you at the back side of the head.

14,128. Did it affect your breathing at all?—Not mine.

14,129. Did the other men suffer in their wind at all?—No; they were old men, they never suffered anything that I ever heard of

Mr. Thomas Watson.

14,470 (*Mr. Davey.*) Are there any levels which are extended very far from the level you have spoken of, or extended to a great distance?—No, not what we call a distance. We had one, and that was about some 60 fathoms from the air communication; but, of course, we had water there and ventilation. A fortnight ago we brought it nearer to it still, so that we are working in comparatively good air in that way. We have not a place in all the district where it is a long way from good air.

14,471. Before you made this communication had you good air or air in which the men could work comfortably?—They could work comfortably on the whole? but at the same time we considered it injurious for any length of time; the men had been working there and in that neighbourhood for the last two years and a half.

14,472. Now the defect is remedied?—Yes.

Mr. Joseph Rodam, Bentyfield Mine,

14,829. (*Chairman.*) Have you ever worked in poor air? —Yes; where we had [to put two candles together in this way (*describing the same*).

14,830. Did you suffer from it all?—Yes, it is very injurious to health.

Mr. Josiah Remfry, Derwent Mine.

14,977. (*Mr. Davey.*) Where do you find the fissures which you speak of, in what stratum?—More especially in the vein which is embedded in the limestone or in the sandstone.

14,978. Does anything come from those fissures, any gas?—I have never observed any, the only thing which I have observed from that is by the candle.

14,979. What has been the effect of placing a candle close to the fissure?—If you put a candle near it or into it I have seen that which would almost make the candle go out; it would probably make it go out if you were to thrust it far enough in.

14,980 Is that from the force of the air coming out of the fissure or from the nature of it?—I cannot see how force can arise, it is from the nature of it.

14,981. If you put a candle does the flame move at all? Yes; I have observed that, as if there were a current, but whether it first goes into the fissure and plays around it I do not know; I cannot see how it can come from the far end of it.

14,982. Is there a current which comes out of the fissure?—I cannot say that I ever observed anything to come out of it, but I have observed a motion in the flame of the candle when I have placed it within the fissure; but I never observed any extra motion of the flame of the candle when outside the fissure.

14,983 A current must come out to blow out the candles?—If there is a current I should think it must proceed from without first.

14,984. Does that effect the air in your level?—It would affect the air in a level which was not very well ventilated. We do not frequently meet with those cavities or fissures.

Mr. William Curry, East Allendale Mine.

15,890. (*Mr. Austin Bruce*) Did you ever suffer yourself from breathing bad air underground?—Yes, I have.

15,891. Was that long ago?—Yes.

15,892. Have you ever known any of your miners suffer from breathing carbonic acid gas in the present mines?—I think not.

Mr. Joseph Cowper Cain.

15,964. (*Chairman*) In the limestone do you find that you get air cracks?—There are a variety of cracks, and no doubt air cracks, because the air is sometimes felt; small quantities come out of those cracks, and it has some little effect upon the light.

15,965 Did you ever find it have any effect upon the men?—No, I never did; and I cannot say that I ever saw it have much effect upon the light here. I have seen it in other mines have a great effect; but I think that this mine is very free from the carbonaceous gas

15,966 You have never seen anything so bad that a miner has been obliged to be pulled out?—Never. We have not had any instance of that sort, indeed it is very free from it. One has known instances of men having been pulled out, and having been killed from it; that is to say, in other districts, not in Weardale. In Alston Moor there were two or three cases.

15,983. (*Mr. St. Aubyn.*) Was the state of the air in the end where the Commissioners were to-day a fair specimen?—I think it is a better specimen than we have had for the last three months, but I think that to-day the end is very near what might be called an average specimen.

15,984. Do your men complain at all of the bad air in those ends?—Only when they cannot work; they complain that they cannot get in to work.

15,985. In your opinion do they continue working for the sake of their bargains after the air has become too bad for them?—I should think that lately they have done it so in this particular mine.

15,986. Do you exercise any control over them in that respect?—We have not done so. We generally leave it to their own discretion, we do not force them to stop longer than they really should when the air is really bad; we do not exercise any influence over them when they find that the air is not fit to work in; we leave it entirely to their own discretion.

16,012. (*Chairman.*) I think you have said that you are the general surveyor?—Yes, of what are called the W. B. mines. I go through the whole of those mines.

16,013. What is the condition of Greenlaws mine so far as regards ventilation?—It is considered to be in a good state of ventilation.

16,014. You think better than this?—I think so; there is not the same extent of workings opened out.

16,015. Have they a horse level there?—Yes.

16,016. Have they any sinking below that?—No, the workings are all above the horse level.

16,017. Have they any cross drifts in search of veins or deposits?—There are several cross drifts.

16,018. And those are well ventilated?—Yes, all of them are very well ventilated, at least upon the whole you may consider it to be in a good state of ventilation. There may be little ends here and there which are a little smoky now and then, but not the usual course; it is only the powder smoke which stays a little before they get a hole through to the other places to cause a ventilation.

16,019. Then you do not use a blast there?—Not where it is not very bad, but where it is very bad we put in the blast at once.

16,020. At what angle would you hold your candle when you consider the air very bad?—The best position of the candle for working in bad air is to put it rather more than horizontal, but I consider that whenever there is the slightest inclination of the candle the air is not good.

16,021. Do you not think that it would be very prejudicial for the men to work in air where you are obliged to put the candle in that position?—I should think that it would be very injurious.

16,022. And it would cost you a very trifling expense, I presume, to put a blast in those ends?—We generally adopted the blast when it is necessary to put the candle in that position or nearly in that position.

16,023. But not before?—Even before that perhaps, much depends upon the state of the smoke and the air as regards putting the blast in; the smoke is the worst thing to deal with in those cases in the ends.

Mr. John Walton.

16,142. (*Mr. A. Bruce.*) What number of men have you at this moment working in places where the ventilation is in your opinion imperfect?—Not more than 20 in this particular mine.

16,143. (*Mr. Holland.*) Are your mines free from dust?—Most of the places are free from dust.

16,144. Are the men annoyed at all by breathing dust?—Not a great deal.

16,145. Are the men much subject to rheumatism in this neighbourhood?—No.

16,146. In speaking of your men as being healthy, you mean that they are healthy for miners?—They are very healthy men.

16,147. Do you mean as healthy as those who work upon the surface, or that they are very healthy for miners?—They are very healthy as miners

16,148. But not so healthy as agricultural labourers?—Scarcely that, I think.

Robert Walton Bainbridge, Esq., Teesdale and Alston Moor Mines.

16,224. In the course of the workings I presume you come upon places where the air is not good, and where the candle will not burn properly?—We may have come upon such a place; but we hold it to be our duty to ventilate such a place.

16,225. Do the men ever complain of it, or is brought under your notice by the men or by the agents?—It would be brought under my notice by the agents. My general instruction to the agents is this, to have all the mines thoroughly well ventilated, and in right working condition. I give them authority to take all the measures they consider necessary or desirable for effecting that object, so that the overman has in his own power at once the remedy for any evil that may arise.

16,226. What are the remedies to which they generally resort to supply, for example, any deficiency of fresh air?—They force in fresh air, pure atmospheric air, into the fore ends, where the men are working.

Mr. Adam Barker, Whitaside and Summer Lodge Mines.

17,033. (*Chairman.*) Have you ever worked in those mines in bad air?—Yes, I have.

17,034. Do you mean want of air or carbonic acid gas?—We wanted fresh air.

15,035. How did you find the want of that; by your own feelings or by the candle?—By the candle chiefly.

17,036. Could you tell the want of air yourself without trusting to the candle?—Yes I could. I was a very hard place that I was working in at Surrender, a place called North Vein. It was about some three or four feet wide between the sides and nothing but vein, with the exception of a little ore, of about half an inch wide, which struck up and down, and we had that to hew out, and then we had to bore a hole in the vein to shut that off to make our dirkway, and it was done by craft, one man having a better idea than another in it. Some men used to come into that place that could not make the picks penetrate it, and it caused a dust to blow about a good deal; and some men used to come out of that place with their whiskers and their hair as if they had been powdered. Strong muscular men without craft could not do it at all, and some men would fetch it off every time they struck by craft.

17,037. Did you ever know men suffer from working?—I suffered a great deal from it. When I was about 40 years of age I began to want wind very much.

17,038. Have you got quite over that now?—No; I never shall get over it.

17,039. Do you attribute it entirely to working in that one place?—I attribute it to nothing else but that very place.

17,040. Were there any means taken to improve the ventilation when you were working there?—Yes.

17,041. What means?—Rising up to get to another place that we could come to above, an old drift.

17,042. But till that was done were any artificial means used?—Not any.

Sir George William Denys, Bart.

17,393. (*Mr. Leveson Gower.*) Have the wages decreased in consequence of the diminution of work?—No; we are paying higher wages than any of the other companies, solely to induce the men to get into poor places. Until quite lately 40*s.* a bing was what they call the head price. We are now paying 50*s.* and even 55*s.* a bing.

Mr. Francis Taylor, Old Gang Mine.

17,594. (*Mr. Kendall.*) Did you ever work in any close fore-heads?—Yes; I was always a dead work or cross-cut workman.

17,595. You worked in close fore-heads?—Yes, as long as I wrought in mines, and after that I wrought the dressings five years before I was agent.

17,596. Have you found your health fail from working in those close fore-heads?—No, I never did much.

17,597. Did the health of any of the men who worked with you in the close fore-heads fail?—Yes; they were older perhaps.

17,598. Do you know any men of the same age as yourself, whose health failed from working in the close fore-heads?—Not exactly at the age at which I gave up.

17,599. But in some other close fore-heads have you heard men complain much?—Some men break up at 60 and some men at 50.

17,600. But they take more care than they did in old times?—Yes; there is much more care and much more ventilation made in the mines by the masters than when I was a worker.

17,601. (*Chairman.*) I suppose that that depends very much upon whether they are poor or rich mines. In a poor mine there is not so much done as in a rich mine in the way of ventilation?—Of course, if it is profitable they will be able to lay more out; but our masters are very good for looking after that, and they always enjoin us agents to look after it.

Mr. Thomas Raw, Surrender Mine.

17,657. (*Chairman.*) Have you ever worked where the air has been bad?—I worked 17 years in the mines before I became a mine agent. In some places I have worked where the air was not very good, but I never took much harm by it.

17,658. Have you seen a case where any gas coming from the rock has put the candle out?—In some cases where we have come at what we call a loff, or an incision in the rock, when it has just become bare, we have seen impure gases issuing out from those places, and it has sometimes put out our candle. We generally call it foul air in our mining term, or poor air; it just comes out of a fissure, and when we have been working in a mine and have laid bare a fissure in the rock in that way we have sometimes found it so.

17,659. What kind of rock was it?—I do not know that any particular rock is more subject to it than another.

17,660. (*Mr Kendall.*) Did you ever in passing by any of those crevices hold up your candle to see whether or not it would put it out?—Yes, I have done so where we have been opening ground; but it does not continue long so, because a current of air passing by extracts it and carries it off. In some places where you have a drift a few fathoms from what we call our air drift we have sometimes found the air very bad, as though the foul air was confined.

Mr. Reubins Atkinson, Arkindale Mine.

17,749. (*Chairman.*) Did you ever work in any close places?—Yes, I used to work in close places.

17,750. Did you ever suffer from it?—I do not know that I did.

17,751. You have no difficulty in breathing now?—A little at present, but not much.

17,752. Do you think that that does not arise in any way from your previous work?—I do not know that it does.

17,753. Have you had it long?—No, not to say long. I never suffered very much from it. I am not so good, in my wind, as I used to be.

17,754. You do not think that that has arisen from your having worked?—No, I do not think that it has.

17,755. Did you ever know any man suffer from working?—I think that they have all suffered from it in the way of breathing, or something of that sort.

17,756. Was that from the air or from the dust?—That I cannot say; it might be from the air or, it might be from the dust, or partly both, I think.

17,757. Before you left off working, you did not feel anything in your breathing?—I was not so capital then as I might have been. I was about 42 when I gave over.

17,758. And you began then to fail a little?—I felt a difference in my breathing from what I was when a young man, and if I had never been in a mine I should have done that I think.

17,759. Did you ever consult a doctor about it?—No, I never had any need of that.

17,760. Could you climb up the stemples as quick as before?—I could climb up the stemples pretty quick, but not so quick as I could when I was 25 years of age.

Mr. Robert Lowes, West Swaledale Mine.

177,781. (*Chairman.*) Have you ever been where the air has been bad?—Yes.

17,782. How have you ascertained that?—The candles burn very badly when the air is bad, and you feel your breathing rather heavy, it produces sort of lassitude, a weakness of system, and also headache.

17,783. Have you known any cases where the men have suffered permanently from it?—No.

Mr. George A. Robinson, Grinton Moor Mine, &c.

17,799. (*Chairman.*) Can you describe the working of a mine where the working had to be abandoned in the plate?—That was in a mine that we had driven up in the 12-fathoms line, and we had to sink from that 14 fathoms, when we came into another lime, and then we wished to make another communication for air. When we came into the plate above the second line our men could with very great difficulty get through it; they did manage to get through it, but the air was so very bad (it was to let off the water), that after we had proved that there was no water I would not allow them to go on any more. I found that in less than a fortnight it had injured their health severely. Our agents were in the other day and could not get a candle in it all; they have sometimes been obliged to put five or six candles together to see at all.

17,800. (*Mr. Kendall.*) How far are they from any opening?—The first level is just above a quarter of a mile long, and then they are 16 or 18 fathoms down; then another adit is driven about 36 fathoms, and a "rise" of six fathoms.

17,801. You had artificial means of ventilation?—Yes, we had both the water blast and the windy king at work, but all would not do.

17,802. (*Mr. Leveson Gower.*) Did the men themselves complain?—Yes; but they never care so long as they can earn extra wages; they do not care what they do.

17,803. (*Sir Philip Egerton.*) In which mine was that?—In Apeldale; you would see the same sort of plate at Hurst, at Prize.

17,804. (*Mr. Kendall.*) Did you ever see a place where it was possible to work at all that a miner would not go in if you would pay him for it?—Never, except one, and that was for water—a place that my father drove up to let some water off, and there was such a great lodgment of water that the men were afraid of it, and he had to promise, if they required it, to go with them they were not afraid of the air. The men complaint, but they know that if

(C a^{n}.) *Poor Air.*

it has to be done it has to be done, and they go and do it.

17,805. (*Mr. Leveson Gower.*) I suppose they complain more in order to raise the wages than to get out of it?—No, I do not think that our men are of that sort; they have a right to complain; but then they know very well that we never do a thing of this sort, except for opening out other workings, so that they will make sacrifices.

17,806. (*Mr Holland.*) Will not men prefer a well-ventilated place even if the wages do fall?—Yes; the men will tell you that they will sooner work for 14*s.* a week in a well aired place than they would work for 1*l.* in a badly aired place.

17,807 Will they act upon that?—Yes, and they will work eight hours a day in a well-aired place sooner than they will four in a badly aired place. I am wrong about men refusing to work Some years ago some men did refuse, and my father could only get one man in the whole of his employ to do it, but he and his son did it.

17,808. (*Mr. Kendall.*) Did they suffer by doing it?—No, I do not think they did. They lived near the place, and they used to go and make their hole, and then fire it and come out again, and wait till it was cleared off.

Mr THOMAS EDMUNDSON.

17,847. (*Chairman.*) Have you observed any particular disease among miners?—I have observed the lungs being affected from breathing the bad air.

17,848. Do you think that that is from the want of circulation in the air?—It is from the want of circulation, and from the place being so close that the carbonic acid gas accummulated, and they had to breathe it over again.

17,849. Have you had any case under treatment at the beginning when a man was first affected?—Yes, numbers; but I generally wished the partners (some men will bear it a great deal better than others) to withdraw them, and put them in a more airy place. There are some who have died, and some who are now asthmatical, as they call it, and they cannot follow any employment.

17,850. Do you think that if they were put into a place with better air they would then completely recover?—Yes, if the lungs were not injured.

17,851. Is it an asthma which is peculiar to miners who are affected with it, or not?—Yes, I believe that after continuing for a length of time the lung becomes hepatised; that is to say, that it is like a piece of liver, that the air cells completely disappear, for with the stethoscope you cannot hear any circulation of air through the air cells. During the time that they are in this air and afterwards, what they expectorate is completely black, and that deposit most likely takes place in the air cells.

17,852. Have you ever observed a case when this black expectoration has continued after a man has left the mine?—Not for any length of time.

17,853. Do you think that this black expectoration arises from the dust?—No; I believe that the blood not having a quantity of oxygen becomes carbonated, that there is a quantity of carbon in it, and that that carbon is deposited in the air cells; in the secretion from the blood.

17,854. You consider the black sputa a secretion from the blood?—Yes, I believe it to be so; and if they are breathing air which has more than its share of carbonic acid gas, it may be deposited as well the other way.

17,863. Have you been in a mine where candles will not burn?—Yes, very often. I have sat with them for hours, and a man will live for some time where a candle will not burn, but we have to slant the candle; the air is very annoying.

17,864. Did you feel any effect yourself?—No. When I get a bad cold I am troubled with asthma, or when I get into certain kinds of air, such as the fumes of rosin or anything of that sort; but I can stop in a mine as long as any of them when the air is so bad that a candle will not burn.

Mr. JOHN TATTERSALL.

18,076. (*Chairman.*) You remember Keldheads when the men first began to work?—Yes, I have reason to remember it; all the levels were broken in, and we had very rough work indeed in the commencement. It had been worked previously by a company, now working the Sedlingstone mines in the north, and it had been standing some 18 years when we took it.

18,077. While you were opening up that mine the men suffered very much?—We could not let them remain above about two hours, from the water pouring down upon them and bad air, but we had none who died, or anything of that sort. They suffered at the time, they were soon right; they did not get what you would call the miners' illness, such as they have on Grassington Moor, they are working there in the grit. We have very little grit work here; the grit work on Grassington Moor seems to affect them much there.

(C a^{n}.) *Poor Air.*

18,078. From the dust?—Yes; we are chiefly in limestone here.

Mr. MATTHEW NEWBOULD, Sunside Mines, &c.

18,137. (*Chairman.*) In driving a forehead do you ever find a want of air on any occasion?—Very rarely.

18,138. How do you ascertain that?—We can tell by the burning of the candle.

18,139. Do the men report if they find it?—We have no bad air, only sometimes it may be rather dull, for want of circulation; there is no fire damp or anything of that sort. Occasionally we have a want of circulation, sometimes even a change of weather affects it.

18,140 Do the men on that occasion leave the work?—No; it is a very rare occurrence for the men to leave the work.

18,141. They work on as long as they can get the candle to burn?—If the candle will burn, then of course they will work on; perhaps it will be rather dull and they may work on as long as they can after that.

18,142. Do they then apply to you for any artificial means?—We make air ways as quickly as we can, as soon as we see that it is really necessary.

Mr. BENJAMIN CALVERT, Nedderdale Mining Company.

18,303. (*Chairman.*) Do you communicate with any of the Old Man's workings?—No, it is a new thing; it is maiden ground. We shall have to do so by and by, but it will be sometime first.

18,304. What communication have you with the surface besides the adit level?—We have two communications; we have one very recently put through near to the head of the adit level; we have another about 100 or 150 fathoms further back.

18,305. In driving, before you put up this last rise to the surface, was the air at all close?—Very much so at times.

18,306. How long were you getting the rise up?—From 5 to 6 months.

18,307. During that time what means of ventilation did you provide?—We had a very powerful water blast, but that water blast was not sufficient to keep the bad air clear continuously; and we had a double communication as well. We had two sets of tubes up into a rise to help us to get this rise put through to another top level; but at times, for four or five days, the air was so bad that no one living could get in.

18,308. Then the men were obliged to leave off work?—Yes, of course. A candle would not burn and a man could not live.

18,309. Do you think that that was affected by the weather?—Yes; altogether by the weather.

18,310. How often did that happen?—I think that happened, we will say, three times in the five months

18,311. Has the new shaft completely remedied that evil?—Yes: we have had to put up doors to quench the air; we could not keep a candle in. We could not get up and down after we got the communication complete; and so we have had small doors put in to prevent that.

18,312. Had you to pay the men higher?—Yes, occasionally; because they must have something to live on, and so we had to give them an extravagant price to get this rise put through. Since that we have reduced the prices.

18,313. The men are always willing to work if you paid them for it?—Yes, they were willing to work when they could; but when they could not it was impossible.

18,314. Do you think that the men suffered at all from working there?—There was no compulsion used. If they had been forced to go in, and to remain in as long as they really could, they would have suffered; but I do not think that they suffered materially at all. If they had continued for a length of time there is no doubt of their suffering. I know that they would have suffered.

18,315. Were they off work from suffering during that time, or were they always able to come as soon as the place would admit of it?—They were always able to come as soon as the place would admit of it; there was nothing to prevent them.

18,316. Do you think that there was any carbonic acid gas generated in the mine, or that it was from want of air?—It was from want of it; but the damp was so strong, that if you had stopped too long you would have fallen down the same as a crow being shot out of a tree.

18,317. Was it worse at the top of the level or the lower part of the level?—It was generally the worst up above; it was owing to some different beds that we had to go through.

18,318. What were the beds through which you were driving before you got the last rise?—In this place it is all shale and grit.

18,319. Do you think that that is worse for ventilation?—Yes, no doubt of it.

18,320. Why do you think that it is worse for ventilation? It contains more sulphur.

Mr. Thomas Wiseman, Appletree-wick Mine.

18,535. (*Chairman.*) Did you ever find the air bad in working these trial mines?—Yes, sometimes the air has been bad at Kettlewell, where we were trying.

18,536. How far have you ever driven a level from the surface where the air has become bad?—400 yards.

18,537. How did you find the air then to affect you?—We found it by the candles; the candles would not burn when the air was bad.

18,538. Did you see any of the men who were working with you suffer from that at all?—No, we did not.

18,539. Did you give up working there?—We would leave it for a few days, or for a week, till the air got good again, and then we would go back again.

18,540. Had you to leave it as much as a week?—I only remember once when we were a week; it was at hay time, and we were at hay, and we did not go for a week.

18,541. Had you ever to leave the work for a day and then go back again, or only for a short time?—Yes, we have had to leave for a day.

18,542. Was that quite sufficient to enable you to work?—Yes, quite sufficient.

Mr. Thomas Job, Hebden Moor Mine.

18,616. (*Mr. Holland.*) Have you observed the same thing from poor air, not dusty?—No.

18,617. What effect would that produce?—You would feel a difficulty in breathing it when you were in it, but you would not feel it when you came out.

18,618. Have you felt all the strength out of you after working in bad air for some time?—I have felt deprived of a part of my strength; you would not feel so fresh.

18,628. (*Sir Philip Egerton.*) Has the air in the middle level been heretofore bad?—No.

18,629. Never?—Occasionally when the damp has come out. When the gentleman came here to test the air, we could not carry a candle in the level.

18,630. What do you mean by "damp"?—The foul air coming out through the crevices.

18,631. That is your name for the foul air which you have described in your evidence?—Yes.

18,632. (*Mr. Holland.*) Do you call it cold damp?—No, we call it damp.

18,633. (*Sir Philip Egerton.*) But you do not feel any ill effects from that now where you are working in the middle level?—No.

18,634. (*Mr. Kendall.*) How long have you abandoned work on account of the damp?—I think two days.

18,635. Have you ever abandoned it before on the same account?—Yes.

18,636. How frequently?—We have had to abandon it twice since January, for about two or three days each time.

18,637. After two or three days is the air very good?—Yes.

18,638. After this oozing out ceases?—Yes.

(b^{n}) TEMPERATURE.

Mr. John Barratt, the Coniston Mines.

13,406. (*Mr. Kendall.*) What is the greatest heat that is to be found there?—About 70° or 75° in the bottom. There is no water in the bottom, not a drop. We have to send down water to bore with, and we are 200 fathoms deep.

Mr. William Mitchell, Coniston Mines.

13,606. (*Mr. Holland.*) Have you any workings where the temperature is such as to impede the working of the men?—The highest I think is not more than 75° or 80°.

13,607. The men cannot work so much in 75° or 80° as they can in 50° or 60°?—That is true.

13,608. You have seen men working in very hot levels in Cornwall?—Yes.

13,609. Can the men employed in the mines here do unquestionably more work then in those hot levels?—Yes.

(C b^{n}.) *Temperature.*

13,610. Can you give any estimate of the difference?—I should think about one half.

13,611. Do you mean to say that your miners here can do twice as much as the others?—Yes, twice as much as in those very deep hot levels.

13,612. Would it not be worth while to expend a good deal of money in order to cool those levels?—That depends certainly upon the state of the mines, and what the prospects of the mines are.

13,613. It would be worth while, would it not, to expend a considerable sum per annum for that purpose while the mines are being worked?—Yes, if you have a good mine.

Mr. Thomas Wilson Crawhall, Rodderup Fell Mine.

14,626. (*Mr. Holland.*) What difference of level is there between the adit and the workings?—30 fathoms.

14,627. What is the difference of temperature?—I never took the temperature, and therefore cannot say.

14,628. Does the lower level feel like summer heat?—No it is quite cool and pleasant to go into in summer.

14,629. In August is it bad?—We have generally noticed that in any bad places August is about the worst time of the year.

14,630. Is that because August is warmest outside?—I suppose so. There are greater fluctuations probably from that circumstance, that the current of air will become stagnant and perhaps reversed.

(c^{n}.)—DEADS AN OBSTRUCTION TO VENTILATION.

(C c^{n}.) *Deads an Obstruction to Ventilation.*

Mr. Jonathan Coatsworth, Keldheads Mine.

17,983. (*Chairman.*) In your bargain with the men, are they obliged to remove the deads?—Yes; there is a man appointed to take the refuse away, but of course they pay for it, and it is generally taken away just as they work it.

17,984. But sometimes there is an accummulation, there is too much?—That sometimes happens when the working is rather softer than usual, and sometimes when it is rather harder than usual, the man that takes away the stuff can hardly get sufficient, and it is kept clear enough. When it is soft it perhaps accummulates a little. Where there are more partnerships than one they cannot all get their work away at one time.

17,885. Therefore the deads accummulate?—Yes' during that time.

17,986. That to a certain extent injures the ventilation in the forehead?—Yes, it injures ventilation certainly; it is a great point to work every mine clean in order to keep the air good.

17,987. In the Keldheads Mine, are the workings very often soft, or are they generally hard?—They are what we consider in a medium way for that. I have seen both harder workings and I have seen softer.

17,988. Does it often happen that the men are working in the soft, and that there is an accummulation of deads?—No; it very seldom happens that there is any accummulation; that is a great point of success in any mine to keep it clear of work. If the men are smothered up with work it is a loss to the company. I take good care of that on the company's account, because the men suffer by it, and they cannot prosecute their work so well when they have work in as they can when it is clear.

(d^{n}.)—DUST.

(C d^{n}.) *Dust.*

Mr. James Postlethwaite, Keswick Mines.

13,817. (*Chairman.*) Is there any place where that is the case now?—I do not know that we have any in this neighbourhood very bad. In Alston the men suffer very much from it; that is in dry mines, and they have a great deal of dust which rises from the breaking of the stone. We consider a dry mine the worst; a wet mine is more healthy, it keeps down the dust arising from the smoke, blasting and breaking of the stone.

Mr. Tinniswood Millican.

14,322. (*Mr. Kendall.*) There are some dry mines and some wet mines; have you ever had occasion to observe whether the miners are most healthy in the wet mines or in the dry mines?—In the wet mines.

14,343. You are of opinion, I suppose, that the dust is more injurious than the damp?—Yes, I am.

14,324. From what does the dust arise, from the boring?

—There is the boring and the blasting, and the cause a deal of soft dust to fly about.

14,325. Is it a sort of impalpable dust that lies about the side also?—Yes; but we can see it.

14,326. Do the miners put anything over their mouths like gauze to keep the dust away?—Seldom. I have seen them have it, but only a few.

14,327. In the wet mines do you lend the miners waterproof clothes sometimes?—Yes.

14,328. Do they work in them underground?—Yes.

14,356. (*Mr. Holland.*) Can you say whether or not the men who work for a long time in dry mines suffer more from these complaints than those who work in the wet mines?—Have you noticed that?—Yes.

14,357. It happens but seldom, I suppose, that they do work only in one kind of mine?—Some of them work a good deal in a sort of damp mine, and others work a long time in a dry mine. I remember some who worked in a dry mine and died sooner than they would have done had they been working in a wet mine, so far as I was capable of judging.

Mr. Thomas Watson, Alston Moor Mines.

14,492. (*Mr. Holland.*) You seem to attribute a large portion of the disease to which the miners are subject to the dust they breathe?—It is partly that.

14,493. Is that in your opinion the chief cause?—Yes, it undoubtedly is, for there have been instances of individuals who had worked for a considerable length of time in this shale, and have then gone to some watering places, and have sometimes vomited what has been a collection of that dust.

14,494. Or coughed it up?—No, vomited; coughing is a common thing, but I mean vomiting, it has gone down, and having been made sick; there have been instances, of course they are rare, but I have known two or three where men have vomited up what was just like a collection of dust.

14,495. Would not a certain amount of ventilation carry away that dust?—It can no more carry away the dust than you could carry away the dust from a stonemason who is hewing the stone.

14,496. Could not the dust be kept down by water, and keeping the holes wet?—I do not know, but perhaps it might; there is a great difficulty in it, and in addition to that it would make the place damp, and the men might be more subject to take cold.

14,497. Would it be very expensive to get water for such a purpose?—It altogether depends upon circumstances.

14,498. Is there not water generally within easy reach in most mines?—Yes, but it would be difficult perhaps to get it so as to work it; you must have a machine of some kind to carry it there.

14,499. Has it never been done?—No; it has never been done in the country, at least, I never knew of it.

14,500. Should you not feel more sanguine of keeping the dust down by water than by any reasonable amount of ventilation?—No; I think not.

14,501. Do you think that ventilation is the best?—I do.

14,502. I thought you stated that ventilation had been carried now as far as it well could be?—Yes, to meet all ordinary cases.

14,503. And yet the men are subject to very great annoyance from the dust?—Yes, and they always will be; where there is a drilling of holes, and striking against the stone with a hard substance as in a quarry, there must be dust as the natural consequence.

14,504. Do you see no remedy for that?—No, I do not see my way very clear for it, at least, to make it practicable.

14,505. Suppose that a respirator could be invented to keep the dust away out of men's mouths, do you think they could be induced to wear it?—I cannot say.

14,506. Do you think there would be much difficulty about it?—I cannot say; we have sometimes thought that if the men would let their beards grow, it might be some advantage to them.

Mr. Josiah Remfry, the Derwent Mine.

14,902. (*Chairman.*) To what particular disease can you say that they are subject?—The disease to which they are subject I believe is caused by their own carelessness or mode of working in a great measure.

14,903. What is the nature of that disease?—They are in the habit of working the pick point when they ought to apply the wedge and consequently making more dust; and they are in the habit of boring their holes dry when they ought to apply water; the consequence is that they make more dust, and from inhaling dust I believe that they get more harm than from any other cause in mining either in ventilation or in any other way.

14,908. Have you observed that the illness which you think arises from dust affects the younger men or the older men most?—Sometimes it affects young men suddenly; we need not go below ground to prove that; I have noticed myself stonecutters who have been in the habit of working on the sandstone to be affected in their breathing sooner than those who have wrought on other work.

14,909. Do you consider that the men who are affected who are working as miners are affected in the same way as the stonemasons?—I do to a certain extent.

14,965. (*Mr. Davey.*) You have said that the miners suffer a great deal from the dust, are there no means of remedying the boring a dry hole?—Yes.

14,966. Do not you enforce that?—I have tried to persuade them.

14,967. You are aware that a hole would bore much quicker with water than it would dry?—I am aware of that.

14,968. And are there no means of convincing the men of that fact?—I cannot convince them of it.

15,018. (*Mr. Holland.*) Do they suffer much from dust?—I fear so.

15,019. You think that they do?—Yes.

15,020. Do you think that there is any practical remedy for that dust?—I do.

15,021. What is it?—To change the mode of working, as I observed at first; to adopt the wedge instead of the point of the pick.

Mr. Thomas Morpeth, the Derwent Mine.

15,063. (*Chairman.*) Is this part of the mine very dry?—A great part of it is dry; towards Taylor's shaft is very wet, and we have got a great deal of water, but east of it is very dry.

15,064. Is there much dust in working the mine?—There sometimes is; but if miners would only adopt our plan, namely, when they are drilling their holes, to have water and something to keep the material from hitting them, there would be no dust.

15,065. Do they do that?—Sometimes; and the holes bore quicker.

15,066. Do you supply the men with the water there?—Yes; if they want water they will get it.

15,067. How do you supply it?—There is plenty of water close at hand, they will take a pail sometimes, or a bucket.

15,068. Do you supply it to them?—No, they fetch that themselves.

15,069. They fetch the pail?—Yes, they have most of those things by them; they get their powder in small barrels, and after the powder is out they have the barrel, and it is no expense to them.

Mr. John Ridley, Coalcleugh Mine.

15,486. (*Chairman.*) What does that arise from?—I do not know much about things of that sort. It may arise chiefly from the dust, I should think, when they are beginning to drill the holes. It creates a dust, and they have to breathe in some of that in certain places.

15,487. Do not they use water to get rid of that dust?—No; I think that that can scarcely be applied.

15,488. Do they not use water in boring the holes?—Yes, sometimes when they have the advantage, if they drive a hole downwards, they occasionally put water in.

15,489. But, it is not universally used?—No

15,490. They are not supplied with water for the purpose?—No.

15,575. (*Mr. Holland.*) But there is a good deal of brokenwindedness among the men nevertheless?—There is among some of them.

15,576. What do you think is the cause of it?—Something like dust, I think.

15,577. Is that the common opinion among the workmen?—I think it is.

15,578. Does the smoke injure them?—It may injure them a little, but I am under the impression that the dust does more harm than the smoke.

15,579. Do you think that the candle smoke hurts them?—Perhaps it may a little.

15,580. Is that the opinion of the men, do you think?—I cannot recollect their ever expressing an opinion with regard to it.

15,581. Are they more liable to catch cold than other men?—I do not know;—they may perhaps, to a certain extent, when they come out of the mine warm.

15,582. Are they often off work from illness?—They are very seldom off work.

Mr. William Curry, East Allendale Mines.

15,825. (*Chairman.*) Is the mine at all wet?—It is dry, comparatively speaking; very dry.
15,826. Do you think that the men suffer at all from the dust?—I think they do occasionally in some places.
15,827. Are they supplied with water when they are boring, or how do they get it?—It is very little used.
15,828. Do they bore dry?—Yes, they do generally; in some few cases they do not, but by far the greatest bulk of it is bored dry.
15,829. Does not water facilitate the boring?—In tough stone I consider that it does, but not much in a very hard one.

Robert Walton Bainbridge, Esq., Teesdale and Alston Moor Mines, &c.

16,304. (*Chairman.*) What is the rock?—There is a great deal of limestone there.
16,305. (*Mr. Austin Bruce.*) Does one sort of rock throw off more dust than another?—There would be more dust in the sandstone and shale than in the limestone.
16,306. Do the men therefore suffer appreciably from working in one sort of rock?—I cannot say that I can speak to the fact of any difference, I do not go so closely underground myself as to enable me to speak particularly upon the point; you will get that better from the more practical agents; I may refer you to them in that respect.

Mr. William Ewart.

16,363 (*Chairman.*) And by the dust?—Yes, the dust being of a mechanically irritating character. I think so on this account, immense quantities of this matter is spat by these miners at all times while they are working; not only so, but there is evidently a deposit of powder in the air passages and cells of the lungs remaining for years after the men have ceased to work in the mines. I have cases every now and then occurring of men who have left the mines I should say nine years, who have not been working in mines but working in the open air; they have kept in tolerable health, they may perhaps have had a slight attack of acute bronchitis now and then; by the appropriate remedies we subdue that, and they get into working order again, they are perhaps not in very good health however; they are perhaps at last seized with a very severe attack of acute bronchitis; they then begin to spit enormous quantities of blue and dark matter, and they perhaps continue to spit this for months before they are cut off, that evidently having been in the lung for years. Of course, I have not had this matter analysed, but to the eye it is plainly like powder floating in thick mucus and pus, what surgeons call muco-purulent matter.
16,364. But you have never looked at it with a microscope?—I have not. I sent some to London some years ago, and I never heard the result. I submitted some, as far as I recollect, to Dr. Greenhow, and I never heard what was made of it.
16,365. Have you in that case ever seen a person recover when he has got rid of that matter?—Very seldom. I always consider that when they begin to spit this blue matter in any quantity, particularly when that is combined with general irritation of the system, it is the beginning of the end.

Mr. William Lee, Wire Gill Mine.

16,869. (*Mr. Kendall.*) Do they suffer much from dust?—Not so very much; they do a little; for instance, at the commencement of the boring operations they must suffer a from the dust, and they must suffer from the fume.
16,887. You say that the men suffer from the dust, is that merely stone dust or lead dust?—Not so much from the lead dust, the principal dust from which they suffer is stone dust; there may be a little of the other as well, but its own weight makes it fall more rapidly than stone dust.

A Miner.

17,004. (*Chairman.*) Do you think that the affection of your breathing was brought on by any work that you were engaged in?—Yes, in a measure.
17,005. What was the cause?—I think that it was affected by the stour; that is to say, the dust.
17,006. In what mine were you then working?—At Hudshope Head and Steer's Mines.
17,007. Are they both the Lead Company's mines?—Yes, I wrought under no one else.
17,008. What was the description of work that you were engaged in there?—Driving in levels.
17,009. Was the stour worse where you were driving a level?—Yes.
17,010. What were you driving through?—Plate.
17,011. Were there any artificial means of ventilation used?—Yes, a water engine.
17,012. Was the air quite good?—Quite good, it was quite clear, good air, and it cleared the reek well.
17,013. How long was it before the reek was cleared?—It might be about about a quarter of an hour, and then it was clear.
17,014 But it did not get rid of the stour?—No.
17,015. Was it very dry?—Yes, quite dry.
17,016. How long were you working in that before you felt anything?—I wrought in that level four years.
17,017. And at the end of four years was that the first that you felt it?—No, I did not feel it for a good bit after that.
17,018. You do not know where it was that you first felt the affection?—No.
17,019. Did it destroy your appetite?—Yes, it took away my appetite.
11,020. Do you think that you swallowed the dust in the stomach, or that it went into the lungs?—I think that it went into my stomach.
17,021. Did you give it out much?—No; I do not smoke, and never did.
17,022. Was your mouth full of dust?—Yes.
17,023. (*Mr. Davey.*) Did you suffer before you had this attack of of inflammation of the lungs?—No.
17,024. You never felt any inconvenience from working in those ends?—Never.
17,025. And the doctor did not tell you that it arose from that?—He told me that it was weakness, from the effects of mining.

Mr. Adam Barker, Whiterside and Summer Lodge Mines.

17,036 (*Chairman.*) Could you tell the want of air yourself without trusting to the candle?—Yes, I could. It was a very hard place that I was working in at Surrender, a place called North Vein. It was about some three or four feet wide between the sides, and nothing but vein, with the exception of a little ore, of about half an inch wide, which struck up and down, and we had that to hew out, and then we had to bore a hole in the vein to shut that off to make our dirkway, and it was done by craft, one man having a better idea than another in it. Some men used to come into that place that could not make the picks penetrate it, and it caused a dust to blow about a good deal; and some men used to come out of that place with their whiskers and their hair as if they had been powdered. Strong muscular men without craft could not do it all, and some men would fetch it off every time they struck by craft.
17,062. (*Mr. Holland.*) You said a little while ago that there was a great deal of dust in the level where you were working 30 years ago: that the men had not craft enough to bring the ore down without making a great deal of dust?—I did; some men had no craft.
18,063. Was that dust very distressing to you?—Yes, it was very pernicious and very heavy.
17,064. Did it distress you very much?—Yes, sometimes it did.

Mr. John Richard McCollah.

17,123. (*Chairman.*) Is there anything besides the want of air in working in the mines which you think injurious to the men?—I am not aware that there are any noxious gases to which the men can be exposed.
17,124 Do they suffer at all from the dust?—Yes.
17,125. Have you ever examined any of the sputa to see the dust?—Yes.
17,126. Is that dust injurious from being merely the dust of the grit, or from having particles of lead in it?—I think it is merely from the dust.
17,127. Do you think that the water is at all impregnated with lead?—I do not think it is.
17,128. Then you think that the injury is not owing to the ore, but that it arises from the dust?—From the dust and from an insufficient supply of atmospheric air in many cases.

Mr. Robert Daykin, Hurst Mine.

17,445. (*Chairman.*) Is any part of your mine dusty?—Yes, where it is hard, and we have to blast, it is dusty.

17,446. Do the men ever complain of the dust?—They complain of the dust, of course, and where blast reek is, but where there is a good ventilation of air that is soon driven off.

Mr. Francis Taylor, Old Gang Mine.

17,535. (*Chairman.*) Is there any part of the mine where it is so dry that there is a great deal of dust in the workings?—There is in certain places where we have cross cuttings.

17,536–7. What is the dust most in?—In grit and shale there is the most unhealthy dust with us; it is worse than lime.

17,538. Is what you call shale the same as plate?—Yes.

17,539. Which is worst, plate or grit?—Grit, if you have to work it with pick; but we generally blast it.

17,540. But the plate you work with pick?—Generally.

17,541. So that it makes more dust?—Yes, and it is more unhealthy for the workers.

17,542. More unhealthy in what way?—From the dust.

17,543. Is there more of it, or is it from the kind of dust?—It is from the kind of dust.

17,544. You think that it affects them more?—Yes, and there is more of it in working with pick than with blasting, after the blast has gone you do not find so much of it, but the men are more exposed to it from being nearer the pick.

Mr. Thomas Raw, Surrender Mine.

17,625. (*Chairman.*) Which kind of dust is most injurious to the men?—The plate.

17,626. In what way?—It seems to be most heavy. I think that it lies most upon the lungs of the men. After they have been in the plate forehead, and have worked hard for a while, they will spit very black stuff.

17,627. Is it that there is more dust or that the nature of the dust is bad?—There is more dust, and the nature of it is bad too; it is heavy and black.

17,628. How long will they spit it after they have left work?—For four or five hours. I should say some perhaps longer.

Mr. John Knowles.

17,717. (*Chairman.*) The men complain, I believe, most of the dust, do they not?—Yes.

17,718. In what place is the dust worst?—It is the worst in a hard, dry forehead where it is to blast.

17,719. Is that worse than where they are in picking?—No, I do not think that it is. Of course, where it is very soft there is no dust, but it is chiefly in a hard forehead.

17,720. (*Mr. Holland.*) In what rock is the dust worst?—In the lime and the chert. The chert is between the lime and the plate. It will not burn to lime, it is kind of hard plate bed.

Mr. Thomas Edmundson.

17,855. (*Chairman.*) Are the mines dusty at all?—Some of them are where they have a great deal of hewing.

17,856. Do you see it worse for dust in any particular strata than in others?—In the grit.

17,857. That is the worst?—That is the worst.

17,858. Is there any plate in these mines?—Yes, there are layers of plate in most of them.

17,859. But the grit is the worst?—I fancy that it is the worst because it is the dustiest.

17,860. Have you been under the ground yourself?—Yes, I have had too much of it; I have worked a mine in the neighbourhood.

Mr. Jonathan Coatsworth, Keldheads Mine.

18,007. (*Mr. Holland.*) You said that the men working in the wet were more healthy than those working in the dry?—So far as their lungs are concerned.

18,008. And you thought that that was because they had less dust?—Yes.

18,009. Might it not be because they work fewer hours?—There may be a little in that.

18,010. They only work about half the time, do they?—As soon as they get properly drenched with water they come out, if it is only two after hours.

18,011. Are you satisfied that the dust is a serious cause of disease?—There is no doubt that it does harm, but what does far more harm than that is the foul air, bad atmosphere; it spoils the blood, and ruins the constitution; that is the worst of anything. Dust has a pernicious influence, but bad gases are far worse than that.

Mr. Henry Daykin, Grassington Mines.

18,408. (*Chairman.*) Do the men suffer at all from the dust in grit in their breathing?—I should say that they will a little.

Mr. Thomas Job, Hehden Moor Mine.

18,602. (*Mr. Holland.*) Is your mine very dusty?—Not particularly.

18,603. Do you think that the dust or the bad air affects the men most?—Dust is very injurious, and bad air is also injurious; but I may say that they have not any bad air in Hebden Moor.

18,604. But you have dust?—Yes, in dry places.

18,605. Does the dust make the men cough much?—I think not.

18,606. Does it hurt them?—It lodges upon the inside.

18,607. Do not they cough it up afterwards?—We do not take any particular notice of that.

18,608. What particular injury do you think that it does?—It may affect the lungs a little.

18,609. Have you noticed that it does affect the lungs?—I judge from my own experience when I worked underground.

18,610. What effect had it upon you?—If I worked in it I felt a tightness, a difficulty in breathing, if it was a close dry place.

18,611. How long did it last?—A good emetic would clear it again.

18,612. But if you did not have an emetic, how long would it be before it would clear?—Not long.

18,613. How long?—It might take a day or two.

18,614. And during all that time you would feel a tightness?—Yes, a little tightness.

18,615. That you think was from the dust?—Yes.

(f^{n}.)—SMOKE FROM POWDER

(C *f*^{n}.) *Smoke from Powder.*

Mr. John R. McCollah.

17,202. (*Mr. Holland.*) Do the men complain of powder smoke?—Yes.

17,203. Do they complain much of candle smoke?—No.

17,204. Was the black spit, which you spoke of just now carbonaceous matter?—No.

17,205. What was it?—It was merely common expectoration.

(g^{n}.)—IMPROVEMENT OF VENTILATION.

(C *g*^{n}.) *Improvement of Ventilation.*

Mr. John Walton.

16,026. (*Chairman.*) I have asked Mr. Cain the principal part of the questions which we think it desirable to put, which you have heard. What is the condition of the men now compared with what it was 19 years ago?—I think the condition of the men is better now than it was 19 years ago.

(m^{n}.)—METAL PIPES.

(C *m*^{n}.) *Metal Pipes.*

Mr. Benjamin Plummer, Goldscope Mine, &c.

13,703. (*Mr. Davey.*) You stated just now that you used zinc pipes; do you find them last as long as pipes made of any other metal?—Yes; they answer much better than tin, which would not do, because the water would deteriorate it.

13,704. Are the zinc pipes cheaper than iron?—Yes.

13,705. What do you pay for them?—We pay 1*s.* 4*d.* per yard for four-inch zinc pipes; No. 10 zinc.

13,706. Has the water no effect upon those pipes?—It has not. I do not know what it would be in a copper mine.

13,707. Do they last much longer than wooden pipes?—Yes; and the friction is not half so great as in wood. A four-inch zinc pipe would convey more air in my opinion than a six-inch wooden pipe.

14,708. Do you lose much air?—There is no necessity to lose very much if the joints are properly made.

(D^{n}.)—SUPERINTENDENCE OF MINES.

(D^{n}.) *Superintendence of Mines.*

Mr. Tinniswood Millican.

14,320. (*Mr. Kendall.*) But is there anyone who superintends that matter in order to see and to report?—They view the mines generally once or twice a week, the overmen do.

14,321. Would it not be advisable if danger sometimes does arise to have not only one person to superintend but also to report upon the dangerous places?—I do not think that is necessary. There is an overman in the mines, and Mr. Watson is the agent; it is his place to see that the overman does what is right.

(E^{n}.)—ACCIDENTS.

(E^{n}.) *Accidents.*

Mr. John Barratt, Coniston Mines.

13,398. (*Mr. Kendall.*) Have any accidents occurred within the last two or three years from anything but blasting?—Yes, a man was killed a year and a half ago in consequence of the ground giving way.

13,399. Is that an accident likely to occur from the nature of the ground?—No; it is very seldom that there are any faults, and this was seen.

13,510. (*Chairman.*) At the bottom of the ladders is it sollered over at each stage?—Yes, and then the next goes behind that. There are bunnings, which means a platform or stage.

13,511. Is that a very necessary precaution in order to prevent accidents?—Yes. We never had but one instance of a man falling, and that occurred some five or six years ago; he slipped down the ladder, and there he stopped.

Mr. William Phillips, Greenside Mine.

13,961. (*Chairman.*) Have there been any accidents in your mine lately?—Not of any consequence; sometimes they might nip a finger, but there have been no accidents since I came here.

13,962. Is there no particular kind of accidents that the men are liable to from working in the mines?—The men are liable to accidents in all mines.

13,963. Do you mean from blasting, or from the falling of the ground?—There have been no accidents from either of those causes since I came.

13,964. There have been no accidents from powder blasting?—Not since I came.

13,965. Do the men use the patent fuze, or a straw?—They use a straw.

13,966. Do they use a copper pricker?—Yes.

13,967. What kind of tamping rod do they use?—A long soft iron rod.

Mr. Tinniswood Millican.

14,217. (*Chairman.*) Are you liable, from the nature of the soil, to crushes?—Sometimes.

14,218. Have any accidents occurred from that?—Occasionally.

Mr. Joseph Denning.

15,405. (*Chairman.*) Are there any peculiar accidents incident to the mining as carried on here?—They are very rare, I think.

15,406. Not from the falling of the earth or the roof?—I think that the mines are generally conducted on safe principles; every precaution I think is used, and when an accident has occurred it has generally arisen from some carelessness or from some uncontrollable and unforeseen circumstance.

15,407. The miners are not, from the nature of the ground they work in, peculiarly liable to accident?—Not at all; of course it is a rock, and they generally should leave sufficient strength in the galleries, but of course the nature of the labour is of a dangerous character.

Mr. Jonathan Coatsworth, Keldheads Mine.

17,998. (*Chairman.*) Have you ever had an accident there?—No, no accidents at that sumpt. This is my ninth year, and we have had two accidents, and that is all. One of them was at Bolton Gill. A man had a careless way of proceeding, and he thought fit to go into old ground to strike out some wood to put into his own place, while cart loads upon cart loads were lying at the level mouth for the men to take in, but rather than take that trouble he knocked out some old wood from an old working, and when he struck it out of course the top came in, and he fell back and dropped into a rise. It was only a fathom or two in height, but he broke his back, and died shortly after. Then, at Cobb's Car, another man had drawn six hours at the sumpt; he was about to leave, and fell into the sumpt. Nobody was there but himself, and for that reason we never could account for it. We did not know whether he slipped his foot or not.

Mr. Henry Daykin, Grassington Mines.

18,445. (*Mr. Leveson Gower.*) Have you ever known any accident from the use of stemples?—I have known a leg or two broken.

18,446. You have known no fatal accident?—No, never in my life.

18,447. (*Mr. Holland.*) Have you known any accident from ladders?—Only slight ones, nothing of any importance.

18,448. No broken bones?—A broken leg, or something of that kind. I know a boy who not long since had his leg broken through falling from a ladder.

14,449. (*Chairman.*) At the end of each ladder is it covered over?—We have what we call a ladder soller, and a manhole through.

14,450. (*Mr. Holland.*) At what distance are your sollers generally from each other?—Perhaps four fathoms.

14,451. How long are the sollers generally?—It depends upon the width of the place.

18,452. What is it generally?—Perhaps 6 feet long by 3 feet 6 in width, something of that sort; but in the main shafts they are larger.

18,453. What is the usual length?—6 feet by 3 feet 6.

(a^{n}.)—ABANDONED SHAFTS.

(E a^{n}.) *Abandoned Shafts.*

Mr. Joseph Denning.

15,408. (*Chairman.*) In the instances where the works have been abandoned, are the shafts closed up?—That is not, I dare say, universally done, but there was a case that occurred in our neighbourhood about two years ago of a man who was not perhaps of the most temperate habits; the bargain days came round once a quarter or six months, and on a bargaining day this man along with his partners came to take his bargain, and upon such occasions he sometimes got upon what they call a spree, he was overtaken by drink, was away from his home for three or four days; enquiries were then made for him, and he was found at last at the bottom of a shaft dead.

15,409. Was the shaft unprotected, that even a sober man might have fallen down it?—I cannot speak to that, for I did not see it.

15,410. (*Mr. Kendall.*) Is it customary or not in this country to leave the shafts open?—They are left open for the purpose of forming a communication between, perhaps, a newer working and an older one.

15,411. Is any guard or fence put round them?—It was not so in the case I have referred to; but, generally speaking, there is.

15,412. There are instances, I suppose, of carelessness in that respect?—I presume so.

15,413. (*Mr. Holland.*) Are the shafts fenced round generally?—They are walled round generally. A masonry wall is put round the shaft top; if not they put wood across.

(b^{n}.)—BLASTING.

(Eb^{n}.) *Blasting.*

Mr. John Barratt, Coniston Mines.

18,376. (*Chairman.*) Have you had any accidents from blasting?—Yes.

13,377. Is it your practice to use the safety fuze?—Very little, but we have tried it over and over again. I am determined to insist upon it now, because I am confident of the advantages and safety which result from it the men have had a prejudice against it.

13,378. Do they use now a pricker and a straw?—Yes, they use a copper pricker.

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13,379. When the accidents occurred were you able to ascertain from what cause they arose?—Some of the accidents occurred from bearing out the holes, most of them, but it is very difficult to get hold of it, for the law is that the men shall have no relief, and there is no doubt that the last man who was killed lost his life in that way; but in about a month after the coroner's inquest it was ascertained that the accident arose from boring out a hole.

Mr. Benjamin Plummer, Goldscope, Yewthwaite, and Castlenook Mines.

13,690. (*Chairman.*) Have any accidents ever occurred from falling off the ladders?—Never. We have had one accident which occurred from the premature explosion of a hole.

13,691. Were you able to ascertain how that explosion took place?—Yes, we could account for it as near as it possibly could be accounted for; the man had blasted the hole before, and at the first blasting the hole that he put the powder into was perfectly sound; he blasted it and it proved to be too strong, or he did not give it powder enough to throw the burthen in, but it made a rent in the rock, and he put powder in again, and probably did not use sufficient care to clear the powder away on the sides, and in using the stemming bar the powder in the crack became ignited, acting as a train to the main charge, he was injured in his arm and very much burned about his face; a lot of stones was thrown into his face, and he was sick for three or four months from it; fortunately his eyes were not injured.

13,692. That accident was caused by an iron stemming rod?—Yes.

13,693. Do you always use an iron stemming rod here?—Yes.

13,694. (*Mr. Holland.*) Do you never use bronze rods?—No.

13,695. (*Chairman.*) Do you use the patent safety fuze?—In some cases we do; where we have wet ground we do, in dry ground the miners prefer a straw.

13,696. Is there any reason why they should prefer a straw?—They have been accustomed to it all their lives, and they say that it makes less smoke than the safety fuze, and is not more dangerous; we have been very fortunate since I have known the mine.

13,697. What is your own opinion with regard to the preference to be given to the safety fuze?—I should prefer using the safety fuze, because I was accustomed to it.

Mr. James Postlethwaite, the Keswick Mines.

13,800. (*Chairman.*) Have you had any accidents from blasting?—Yes, we have had two, one rather serious, and the other slight. The men both recovered, and are working again.

13,801. Were you able to ascertain the cause of the explosion?—Not certainly, but I conclude that it was by stemming the holes too hard, and with too hard material.

13,802 (*Mr. Holland.*) Do you use iron stemmers?—Yes.

13,803. (*Chairman.*) What is the material which you use for tamping?—A very soft clay slate; it is a rare occurrence to have a hole explode in the hands of the men.

Mr. Tinniswood Millican.

14,277. (*Chairman.*) Have any accidents occurred from blasting in your mines?—Sometimes.

14,278. Do the men use the patent safety fuze or a straw?—The men do not like the fuze, it has such a bad smell. We have several times got it for them, and wished them to use it, but they do not like the smell of it at all; they prefer the squib.

14,279. Have they any other objection to the patent fuze?—I do not recollect any other.

14,280 How are the accidents from blasting occasioned?—In charging the holes generally, it strikes fire.

14,281. Do you use iron tamping rods?—No, we use copper, we think that they are safer.

14,282. Do you mean iron coppered over?—Yes.

14,283. How far up does the copper reach?—I should think perhaps half an inch or three quarters.

14,284. Are the prickers made of iron or of copper?—Of copper.

14,285. If the tamping rod is of brass and they only use that how should an accident happen then?—Sometimes there may be some unsound holes, and they may hit a corner with the driver and strike fire unexpectedly.

Mr. Thomas Watson, Alston Moor Mine.

14,396. (*Chairman.*) Have you had any accidents from blasting?—Very seldom.

14,397. When any accident does occur what did you think it arises from?—It sometimes arises from this: In the great limestone there are several crevices, and in putting the powder into the holes, which are bored at the trials, some of the powder sometimes gets lodged in those crevices, and it may be that when the men are charging it, the iron on the driver, as we call it, sometimes catches the edge of the crevice and strikes fire.

14,398. That is at a point above where the copper is put on?—Just so.

14,399. The driver is copper pointed?—Yes, on the mouth of the driver.

14,400. What is the reason that the men do not like the patent fuze?—Just because of the disagreeable smell.

14,401. Is more smoke caused by it?—Yes, I think there is. I do not think there is any more from the powder, but there is from the fuze itself, and that is disagreeable.

14,402. Is there any other reason why they should not be used arising from the nature of the work?—I do not know that there is. There is the habit of the men; they have always been accustomed to their own mode of charging their holes.

14,403. Do they take the powder down into the mines with them in bags?—They used to take it down in bags, but we do not allow them to do so now.

14,426. With regard to the safety fuze, you say that the men dislike it?—They do.

14,427. Do you consider that it is more safe than the other plan?—We do not think it is, except in a wet place; we generally use it in sumpting in wet places, but that is the exception.

14,428. Do you leave it to the option of the miners to use the safety fuze, or not, as they like in wet places?—Yes.

14,429. And yet you consider it more safe in wet places than the other place?—It is more safe in this way, not on account of accidents, but there is a greater probability of a hole not missing fire, as we say, or not going off, should the least quantity of water get into the hole in the way that they are commonly charged, then of course that will damp the powder, and it will not go off.

14,430. You mean that the safety fuze is not so liable to damp?—Just so.

14,431. You do not think that it is less dangerous?—No, but it is not so liable to damp.

14,432. When the fuze misses fire, and the hole has to be worked out again, then there is danger, is there not?—Yes; there is.

14,433. Do you consider that the danger is more or less with the safety fuze than with the other?—It is more: because the hole would have to be bored out again.

14,434. Do you consider that the safety fuze is less dangerous to human life than the other or more so?—I do not suppose there is much difference in that way; the only danger that I spoke about was stopping the work.

14,435. You mean that it is less effective?—Just so.

14,436. Will you describe to the Commissioners how the blasting is done?—I presume that the drilling of the hole is well understood when the gunpowder is deposited in it; we have then what we call a pricker, with a sharp point made of copper, and it has a round eye to put in the article with, and to bring it out after we have got it fixed; then we put this pricker into the hole, and we have a driver that is in that shape (*describing it*), and we put that under the pricker in that way (*describing the same*), and put the stemming down on the top, and that makes it hard round the pricker.

14,437. What material do you stem with?—We stem with shale commonly; when the hole is properly filled up with the stemming, we just draw out the pricker, and put what we call a squib into the place; but coal miners for the most part put in a straw.

14,438. Who makes the squib?—The men make it; it is a roll of paper with powder inside.

Mr. Joseph Rodam, Bentyfield Mine.

14,819. (*Chairman.*) Have you had any accidents in your mine?—We had one.

14,820. What was it from?—A man fired a hole.

14,821. It was from blasting?—Yes.

14,822. Did you ascertain the cause of its going off?—Yes, from charging the hole.

14,823. Did he use an iron tamping rod?—No.

14,824. Was it brass tipped, or copper?—It was copper; I think he had not been careful of the material which he had put in; it was from his own neglect.

14,825. From using bad tamping?—He had put in a bad material.

14,826. Are the men supplied with any special material, or is it left to them to choose the material?—They have been particularly cautioned about that several times; they have it lying by their sides, it may be two or three yards off; I have seen a good deal of that.

Mr. JOSIAH REMFRY, The Derwent Mine.

14,885. (*Chairman.*) Have you any accidents from blasting?—We have had slight accidents but not serious ones.

14,886. Do the men use the safety fuze?—They are prejudiced against the safety fuze; we have it, and we are anxious for all to use it, but they have been so accustomed to the needle, or what they call the pricker in the north, that they prefer it.

14,887. Do they use a copper pricker?—An iron one.

14,888. And an iron tamping-rod?—Yes.

14,889 What material do they tamp with?—Shale or the borings from the hole.

14,890. Within the last three years do you know of any accident having occurred?—Since I have had the management, which is now nearly seven years, we have had no accident from blasting but one, that I recollect, and there the man lost the sight of one eye.

Mr. THOMAS WARE, Stove Croft and Grey Side Mine.

15,345 (*Chairman.*) Have any accidents occurred from blasting?—Only one, about a year and a half since; we tapped a large quantity of water, and we were drowned out for six or eight months; the workmen's tools were left underground; we do not use any safety fuze, and the pricker that was left in got corroded; the men did not bring it out to have it filed down and made smooth. I attribute the accident to that, in putting in the powder and rubbing it against the side of the rock which caused the powder to ignite from the roughness of the pricker.

15,346. Was it an iron one?—Yes.

15,347. If it had been made smooth you do not think the accident would have happened?—No.

15,348. Do the men use a straw?—A paper match generally; some of them use a straw.

Mr. GEORGE HENDERSON, Fallowfield Mine.

15,439. (*Chairman.*) Have any accidents occurred in the mine from blasting?—No, we never had any.

15,440. Do you use the safety fuze?—Not extensively, only in sinking when there is wet work; we find it very beneficial in any place where much water comes out; but in a general way we do not use it.

15,441. Is there any reason why it should not be generally used?—I think that the other is more effectual, except in these cases, and then it is very useful.

15,442. Is a straw or paper match in use?—Paper.

Mr. JOHN RIDLEY, Coalcleugh Mine.

15,491. (*Chairman.*) Have you any accidents from blasting?—Very seldom. There have not been above two or three in my recollection. I think there may have been some smaller ones, but very few accidents; the men are very careful in regard to gunpowder.

15,492. How do they take the gunpowder down, in tin?—They have bags generally; our miners have bags. They sometimes take in a quarter barrel at a time when the mine is dry, and put it in a convenient place, others sometimes take the gunpowder to some of their own places, and put it where it is safe, and carry it in woollen bags.

15,493. What do they bore with; have they all iron borers?—No, they are steel borers.

15,494. What do they use as a tamping rod?—They are generally made of iron, but there is a little steel on the end, they are what are called the hammers.

15,495. Do they use the safety fuze?—No. They make squibs of paper.

15,496. And they use a pricker?—Yes.

15,497. Is it an iron or a copper pricker?—Generally copper now; they did use iron, but most of them have copper prickers now.

Mr. WILLIAM CURRY, East Allendale Mines.

15,816. (*Chairman.*) Have any accidents occurred from blasting?—We have had accidents occasionally, but very seldom.

15,817. Do the men use the patent fuze?—Never, except in wet places in sinking.

15,818. Is there any reason why it should not be generally used?—No; I do not see any particular reason why it should not be generally used beyond the extra cost incurred.

15,819. Do the men prefer the other mode?—Yes, they do.

15,820. Do they use copper or iron prickers?—Some are copper, and some are iron; the principal part are iron. In the hard mines, where they are more subject to explosion, they are copper, and in the softer mines they are iron.

15,821. Do you mean by softer that they are not liable to explosion from the pricker coming in contact with the rock?—I mean they are not so liable as the others.

15,822 In the case of the accidents that have happened, have you been able to trace the cause of them?—In some of them we have; nearly all, in fact. I have known an accident occur where a hole has been charged, a squib has been put in, and has burned down half way, and then exploded, just when the men were going back to take it out; in other cases, from cracks in the rock, where the gunpowder has got in, and in beating to fill the hole up, it has exploded in those cracks.

15,823. I suppose the tamping rod has come in contact with the rock, a spark has been struck, and the powder exploded in the crack?—Yes.

15,824. If the tamping rod had been made of a material that would not have struck fire against the rock, the accident would not have happened?—No; it would not have happened.

Mr. JOSEPH COWPER CAIN.

15,990. (*Mr. St. Aubyn.*) Nor from blasting?—We sometimes have an accident from blasting, but it is very rare. I believe that there have been only two since I came to the district, which is 4½ years, and there are a great number of men.

15,991. In those two instances was the cause to be ascribed to the men's carelessness?—I think not, I think it was purely accidental, simply from the fact that the holes which they were boring were in broken ground, lime-stone, with a little iron in it; the powder got lodged and did not get to the bottom of the hole, and the powder got fired in tamping.

15,992. You do not use the safety fuze?—Very little indeed, chiefly from the fact that it creates such a disagreeable smell, and more smoke than an ordinary squib.

15,993. I understand that in this district the men object to the safety fuze on account of the smell which it creates?—Yes, it would be necessary to enforce it if it were used, on that account. In addition, there is an extra quantity of smoke.

Mr. THOMAS RAW, Surrender Mine.

17,666. (*Sir Philip Egerton.*) Do you work principally by pick or by blast?—Both ways. Where it is pickwork we work with pick, and where they cannot get it by picks they then blast it.

17,667. Are your blasts fired by fuses or by squibs?—Sometimes, when we have water, by fuse, and when it is dry by squib.

17,668. How are they tamped; is it by an iron tamping tool?—Yes.

17,669. Is there no copper at the lower end?—No; we make our needle of good iron, and what we call the beater is made of the same.

17,670. Have you found that the iron tamping rod is liable to make sparks when it comes in contact with the chert?—We have had very few accidents.

17,671. You have had accidents?—We have had accidents on some occasions, but I have always blamed the men. They have perhaps got the chert into the hole to tamp with.

17,672. Have you seen tamping tools shod with copper?—I have.

17,673. Do you not think that they are more safe to use than iron ones?—Perhaps they are safer; they will not fire as the iron will; but if the miner uses great care in his tamping there is no danger.

17,674. Is it usual to use iron tamping rods?—Yes.

17,675 Do the other mines use copper ones or with copper bottoms?—Not in this neighbourhood that I know of.

16,676. Have you had any recent accident from any explosion in a mine?—No.

17,677. When was the last that you remember?—It is a good few years ago since we had an accident, I should say eight or ten years, and the man was so foolish that he beat the hole before he should have done so.

17,678. Have there been any accidents in a neighbouring mina?—Not that I know of.

17,688. (*Mr. Holland.*) Do you use any precaution to prevent accidents in blasting?—Yes; we generally caution the men.

17,689. Do you put anything soft between the tamping and the powder, any hay or paper, or anything of that sort?—They generally put what we call dust if they have it.

17,690. You mean sandy material?—Yes.

17,691. (*Mr. Kendall.*) Do you recommend the men to tamp with oak at first; in some parts of the west of England, for the first layer or two, until there is something between the powder and the iron, they use oak; do you use that here at all?—No. As soon as they have got the powder into the hole they put it up with what they call the scraper as close and tight as possible.

17,692. What is the scraper made of?—Iron.

17,693. No sooner is there powder than you have that iron in contact with that powder?—Yes

17,694. And then you have dust or shale?—Yes; and then you put in the needle, and then you put in the beater.

17,695 (*Mr. Holland.*) Is the needle an iron needle or a copper needle?—An iron needle.

17,696 (*Mr. Kendall.*) Notwithstanding all that, you have not heard of an accident for many years in the district?—No; we have not had one at our place for many years, and I do not know that there has been one in the neighbouring fields

17,699. (*Mr. Holland.*) When you are not in water do you use a common reed or straw?—We use what we call a squib, made with paper, when we are not amongst water.

17,700. Does not that frequently miss fire?—No; if they are properly made they never miss fire.

17,701. Are they very often improperly made?—That is the men's neglect if it is so.

Mr. Johnathan Coatsworth, Keldheads Mine.

18,001. (*Chairman.*)—Have you ever had any accidents from blasting?—No, not one since I came.

18,002. Do you take any particular precautions in blasting?—Yes.

18,003. Are there any rules laid down as to the way in which the men should blast in order to prevent accident?—The principal danger is from firing the powder. Generally if the men are boring in a dry place I get them to take care of the borings of the holes, to fill their holes with fine stuff before they put the needle in, that will not strike fire, and there is then no danger. When they strike fire, it is perhaps from putting in a bit of hard stone; it takes hold of the needle if it is too big, and drives the needle against the sides of the hole which they have drilled, and it strikes fire; but if they put in the small dust it does not take hold of the needle, and is quite safe. We have never had an accident of any sort through blasting, except in one case some men had a powder bag carelessly lying with a bit of powder in, and they fired it, and burnt themselves a bit. That is two or three years since.

18,004. Is there any difference in the description of rock a s regards danger from fire?—Yes.

18,005 Would the small dust from boring from any kind of rock answer for tamping?—Yes, in any sort of rock; it does not matter what kind of dust it is, it will do. When we are working in this black plate (*pointing to the map*) it will not give any fire at all; but either the grit or the limestone will give fire.

18,006. (*Sir Philip Egerton.*) There is a great deal of chert in the limestone?—Yes; it is of a hard texture; some of the limestone gives a good deal of fire.

Mr. William Barron, Craven Moor.

18,289. (*Chairman.*) Have you any accidents from blasting in your mine?—Not here; not much in the limestone. It is a very safe thing for that.

18,290. Is it the same in other strata?—No, not in the grit stone or the blue slate rock, or anything of that sort; it is more dangerous there. I should recommend copper prickers to be compelled to be used at those places.

18,291. Would it not be equally dangerous with the jumper or the tamping rod?—No, not with the tamping rod. With a copper pricker and an iron tamping rod very few accidents occur.

18,292. (*Mr. Holland.*) What is your tamping material?—Merely shale or a little baryta.

18,292a. Is there that in the mine?—Yes; but we generally use shale.

18,293. (*Chairman.*) Do you use fuses at all?—No, we use straws; we only use a fuze where it is very wet; it makes to much smoke when it can be done without.

18,294. (*Sir Philip Egerton.*) Do you use small powder or large powder?—Both kinds. The small powder is generally used where it is dry work, and the other when it is very wet.

Mr. B. Calvert, Nedderdale Mining Company.

18,338 (*Mr. Holland.*) Do you fire your blasts by means of greased paper?—They do it chiefly by straw

18,339. Is the straw lighted by a piece of greased paper?—Yes; a greased match.

18,340. Does that burn pretty regularly?—It depends upon the making of it. If it is twisted too tight it cannot burn, when it burns very slowly.

18,341. Does it ever burn unexpectedly fast?—No, I do not know that it does, not too quick.

18,342. But sometims too slow?—It is sometimes too slow.

18,343. Does it ever miss fire?—The straw sometimes does.

18,344. But the match does not, does it?—Sometimes it does go out.

18,345. When the straw misses fire, do you hole it out again?—We generally try to get it out and put in a second one.

18,346. Can you get it out safely?—Yes, with a straw you might.

18,347. Does it ever fire when you are getting it out?—No; but if you cannot get your straw down sufficiently, and have to bore it out there is a risk.

18,348. Do you believe that in that case the powder can be got out dry?—Very often when it does not go it is on account of the damp, and on account of getting wet, and there is no danger if it is wet in boring it out again.

18,349. You trust to that, do you?—Yes; that is trusted to, and perhaps rather too much.

Mr. Joseph Broad Champion, Merryfield Mine.

18,385. (*Chairman.*) Have you ever any accidents from blasting?—No.

(c^{n}.)—FALLING AWAY FROM THE LADDERS.

Mr. James Postlethwaite, the Keswick Mines.

13,797. (*Chairman.*) Have you ever had a case of men who were going down the ladders, falling from the ladders?—I have had men fall a little way twice, but they were very little worse. We have stages in the ladders at a certain distance.

13,798. At the foot of each ladder it is sollered over?—Yes, a man would only fall a few yards or feet, and not be any the worse; they generally stop on the stage.

13,799. If that was not the case, they would fall to the bottom and be killed?—Yes.

Mr. Joseph Cowper Cain.

15,988. (*Mr. St. Aubyn.*) You have scarcely any accidents from falling away from the footways?—No, it is of very rare occurrence.

(d^{n}.)—FALL OF THE ROCK.

Mr. Joseph Cowper Cain.

15,989. (*Mr. St. Aubyn.*) Nor from the falling away of ground?—That is equally rare.

(h^{n}.)—TIMBER WORK IN MINES.

Mr. Tinniswood Millican.

14,217. (*Chairman.*) Are you liable, from the nature of the soil, to crushes?—Sometimes.

14,218. Have any accidents occurred from that?—Occasionally.

14,219. Do you use plenty of timber to shore up with?—Yes; we give the men the choice of what timber they think proper, in the wood yard, and an opportunity to choose the best timber.

14,220. Do they put it up themselves?—Yes, generally.

14,221 Are they supplied with the timber free of expanse?—Yes.

Timber
Mines.

14,222. Does it rest with the men or with the manager to say where timber is required to be put up?—Men; we let them judge for themselves; sometimes we press it on them, and think that they ought to have more. With a mine that requires much timber, it is our consideration whether it will pay us to let the men work that mine or not; sometimes it will cost us more than it ought, and it will not pay, and in fact then we do not allow them.

14,223. Therefore, if the ground is of such a character as to require a good deal of timber you would probably abandon it?—When we allow them to work they are supplied with as much timber as they think necessary.

14,224. Is that abandonment of a mine of frequent occurrence or not?—No, it occurs very seldom.

14,225. Is the timber periodically inspected by any one in order that they may see it is properly put up?—Yes, it is periodically inspected by the overmen and the agents.

14,226. Do they report to any one as to its efficiency or inefficiency?—No, they do not, but they see that it is done in the way that it should be done.

14,317. (*Mr. Kendall.*) With regard to the wood work, you say that sometimes it becomes a question whether a working should be continued, although the ore may not be scarce, in consequence of the very great expense to be incurred for timbering, and that sometimes you resolve to abandon it?—Yes.

14,318. Just prior to abandoning a working do the miners become careless, which makes it necessary to be very cautious, or, in other words, do they use less timber than they ought to do?—We look to that so as to get them to use plenty of timber.

14,319. They will, I presume, have to bear the cost of putting up the timber?—Yes; but we let them have what timber they have a mind to have.

Mr. Thomas Watson, Alston Moor Mines.

14,469. (*Mr. Davey.*) Is that a matter that is left to the men or to the agents to inspect it?—The agents inspect it. I have prepared a paper, showing the cost per fathom of timbering the mines, and the cost per fathom of arching the mines, which I will hand in.

The same was handed in as follows:—

The Lead Company's Mines, Nenthead.

Cost, &c. per fathom of timbering the mines:—

	£	s.	d.
To 9 pieces of larch timber 6 feet long, each containing 1¼ cubic feet, at 1*s.* 6*d.* per foot -	0	16	10½
To 12 pieces of larch timber 6 feet long, each containing 3 superficial feet, at 1½*d.* per foot -	0	4	6
To carriage of timber from wood yard to the mines, 47 feet, at ½*d.* per foot - -	0	1	11½
To carriage of timber into the mines, 6 waggons, at 4*d.* per waggon - - -	0	2	0
To fixing timber, 2 days, at 3*s.* per day -	0	6	0
To filling and drawing work produced in fixing timber, 3 waggons, at 8*d.* per waggon -	0	2	0
Total cost per fathom - - -	1	13	4

Cost, &c. per fathom of arching the mines:—

	£	s.	d.
To winning and leading stones to the mines, 1 fathom, at 8*s.* per fathom - - -	3	8	0
To taking stones into the mines, 6 waggons, at 4*d.* per waggon - - - -	0	2	0
To walling and arching levels, 1 fathom, at 11*s.* per fathom - - - - -	0	11	0
To filling and drawing work produced in fixing arch, 3 waggons, at 8*d.* per waggon - -	1	2	0
Total cost per fathom - - -	1	3	0

Thomas Watson (Tees).

4th October 1862. -

Mr. Josiah Remfry, Derweut Mine.

14,863. (*Chairman.*) Have you any man specially appointed to look after all the timber work?—Yes, whose sole business it is to see it is kept in proper repair.

Robert Walton Bainbridge, Esq.,
Teesdale and Alston Moor Mines.

16,162. (*Chairman.*) Are you obliged to use much timber?—Yes; we use a large quantity of timber.

(f^{n}.)—TIMBER WORK IN MINES.

(E h^{n}.) *Timber Work in Mines.*

Mr. Henry Daykin, Grassington Mines.

18,426. (*Chairman.*) Do you use much timber in your mine?—In some places we do, and in some places we do not want any.

18,427. Do you judge when it is necessary to timber, or do the men apply for it?—The men know as well as we do.

18,428. And can they always get it?—Always; they have access to it at any time. We have plenty of timber, and the men always have it to go to when they want it; sometimes we will scold them for not taking it; sometimes they work where it ought to be put up, and it is not put up.

18,429. Do you fine the men at all for anything?—We do for bad conduct.

18,430. Supposing that a man was working where timber ought to have been put up, and where it was dangerous to work without it, and he had not applied for it, should you fine him?—No; we have never done so to my knowledge.

18,431. But you would find fault with him?—Yes.

18,432. From the fear of being found fault with, is it likely that he would make an excuse that he could not get it?—I should think that he would not, seeing that it was there knowing that he could get it, because we have always plenty ready.

18,433. You always have it ready sawn?—Yes.

18,434. Then if a man stated that he could not get it, that no timber was sawn, you think that that would only be an excuse?—Yes; we have always plenty of timber on hand. I never saw a better place.

(k^{n}.)—STONE ARCHING.

(E k^{n}.) *Stone Arching.*

Mr. Tinniswood Millican.

14,201. (*Chairman.*) Are they sinking shafts or driving drifts?—They are driving drifts. First, we drive a level; we open up by driving a level 6½ feet by 4½ feet, then we blast it; and then after that, when we get as large a place as we want, we put in a stone arch.

14,202. Is that cheaper than wood?—Yes; and it is more lasting, and it makes a firmer job of it.

14,203. Do you know what the comparative expense of the two modes is at first?—I should think that there is somewhere about 10*s.* a fathom difference.

14,204. Do you mean that the stone is 10*s.* a fathom dearer than the wood?—10*s.* a fathom cheaper; when we can get stones at 8*s.* per fathom, and have easy access to the place we wish to arch, the stone answers the best.

14,205. In the first construction, is it cheaper?—Yes; in a place like this where we drive a level and cut it down about 10 feet, and we keep the refuse to put upon the arch, and sometimes require more to be brought from some other place in the mine to keep the working more secure.

14,206. You get rid of the refuse in that way?—Yes, as much as we can in that way, and it keeps the mines more secure.

14,315. (*Mr. Kendall.*) Do any of the arches of which you have spoken ever give way?—Not often.

14,316. Have you ever known some of them to give way?—Occasionally.

Mr. Josiah Remfry, The Derwent Mine.

14,884. (*Chairman.*) Do you use wood at all?—We do, a good deal, but some of our levels are walled and arched with stone.

Robert Walton Bainbridge, Esq., Teesdale and Alston Moor Mines.

16,164. (*Chairman.*) Do you make arches?—We always arch our levels with stone arches, as a matter of course, that is our horse levels. I may say that universally we arch our horse levels, and we arch such opening drifts above as we conceive are likely to be of permanent use.

(l^{n}.)—WATER IN MINES.

(E l^{n}.) *Water in Mines.*

Mr. Tinniswood Millican.

14,327. (*Mr. Kendall.*) In the wet mines do you lend the miners waterproof clothes sometimes?—Yes.

14,328. Do they work in them underground?—Yes.

14,329. Must not the perspiration while wearing the waterproof clothes be very intense?—It is a very rare case. It is so sometimes in very wet places, just for a time.

(E^n.) ACCIDENTS.

(E^n.) *Water in Mines.*

14,330. When they come to the surface do they leave their waterproof garments there?—They leave them inside generally till they go back again.

Mr. Josiah Remfry, The Derwent Mine.

14,947. (*Chairman.*) Is there any part of these mines very wet?—There is no part very wet; perhaps out of the 264 or 265 men not more than half a dozen at present are subjected to water above their heads.

14,948. When that is the case, is there any means to protect those men from the wet?—We provide them with oiled jackets and hats.

14,949. And are they able to work with those?—They are; they are made loose.

Robert Walton Bainbridge, Esq., Teesdale and Alston Moor Mines.

16,179. (*Chairman.*) Is your mine a wet mine in any part of it?—Some of them are wet and some dry; they vary very much in that respect.

16,180. In a wet mine what means do you resort to to get rid of the water?—It descends into the horse level; we have pumping occasionally; in our Little Eggleshope or California mine we have pumping.

16,181. How is the pumping carried on?—By hydraulic pressure; we have no steam power, but an upright column of water.

16,182. That works the pumps?—Yes.

16,183. Is that sufficient?—Quite sufficient to relieve the mine of the water.

Mr. Jonathan Coatsworth, Keldheads Mine.

17,960. (*Chairman.*) How is the water taken from the Ashbank level;—It passes out at the level mouth.

17,961. Is there any accumulation of water between the two levels?—Yes; in Keldheads bottom lime we work it from the high level, and we have a pump perhaps 50 yards from the surface at Keldheads.

17,962. That is worked by a water-wheel?—Yes.

17,963. Ashbank level is very wet, is it not?—Yes, it is a very wet level indeed.

17,964. Do you give the men any waterproof clothing?—Yes, the company have found them with a sort of glazed jacket to screen them from the water as much as possible.

17,965. But I suppose that the men cannot help getting wet going in?—They cannot help it.

17,966. Do you see any difference in the health of the men who work in a wet mine compared with those who work in a dry mine?—I believe that the men working in wet places, provided they do not stay too long, enjoy better health than the others, because the wet settles all the dust, if they do not stay to get cold, I believe that it does their lungs less harm than in dry places; where it is wet they do not stay long hours; as soon as they get very wet they go home, let it be when it will.

17,967. How many hours do they work?—Six hours is the usual time for working.

17,968. But they do work less?—Yes; at the end of three or four hours they generally leave when it is very wet.

17,968*a*. Do they change their dresses when they come out of the mine, or go home in their wet dresses?—They generally change.

(F^n.) CHANGING HOUSES.

(F^n.) *Changing Houses.*,

Mr. John Barratt, The Coniston Mine.

13,443. (*Chairman.*) Do the men change their clothes when they go underground?—Not in the mines; they change them all at home.

13,444. How far do the men live from the mines?—In the village about a mile or a mile and a half off; the distance does not exceed that

13,445. Do the girls who are employed work under cover?—Yes; they are smallish girls.

13,446. And do not the men want any changing house?—No. We tried that many years ago, as far back as 20 years ago. We built a place, but they would not change there; and, finding that, what we have done since that has been this, we have made a convenience of most of the cottages, and we have about 70 or 80 in the village. We put a back kitchen, or a pantry, in which there is a fireplace, where the men can change and dry their clothes; but they are not made wet in the mines, they are all dry.

Mr. James Postlethwaite, the Keswick Mine.

13,796. (*Chairman.*) Where do they change?—In the engine-house, and above the boiler, we have a place there for drying their wet clothes.

Mr. Tinniswood Millican.

14,261. (*Chairman.*) Do the miners change their clothes when they come out of the mine?—Not until they go home.

14,262. Have they no place to change in?—No.

14,263. In wet mines, do not the miners get wet?—They go home to change them; they go home in their wet clothes; but we allow them, when they have worked in a very wet place, a waterproof suit to put on.

14,264. There are, I believe, some very wet places in the mine referred to?—Yes.

Mr. Thomas Watson, Alston Moor Mine.

14,462. (*Mr. Davey.*) Do you not think that if they had changing houses close to the pit, they would be a great benefit to the men who work in cold and wet places?—Yes; when the men are living at a great distance from the mines, but in Nenthead the men are close to their own homes, and they have their families, their wives or daughters, just as the case may be, being their housekeepers, and they have their clothes already warmed when they go home in order to change at once.

14,463. I understood that they did not change?—Not at the mine, but when they get home they change at once, and put on warm clothing. We have some waterproof clothes with which we supply the men when they go into wet places.

14,464. Are they able to work in waterproof clothes?—Yes, what we call waterproof clothes, the greatest quantity of the water goes out; they are similar to what keelmen use on the rivers.

14,465. Would not the perspiration be very oppressive to the miners?—That is one thing that sets them against them very much; the men that wear them can never stand long shifts, for they are very exhausting.

Mr. Thomas Wilson Crawhall, Rodderup Fell Mine.

14,581. (*Chairman.*) Do the men who do not lodge there change their clothes when they come out of the mine?—No, they generally go direct home as they are.

14,582. Do they get wet at all?—No, there are very few wet places.

14,583. (*Mr. Holland.*) Are they wet with perspiration?—I wish they were a little more so. I do not think that they suffer very much in that way.

Mr. Josiah Remfry, The Derwent Mine.

14,869. (*Chairman.*) When the men go in and come out of the mine do they change their clothes?—They all change.

14,870. Is there a place for changing?—Yes.

14,871. Is it provided with hot water and means for drying the clothes?—There are means for drying the clothes, but there is no hot water; the people in this country do not avail themselves of those privileges, most of them prefer changing at their own houses.

14,872. But, if they choose, they have the means of changing at the mine?—We have many Cornish men and Devonshire men, those change at the changing house and not at their lodgings.

14,873. What is the mode of drying?—We have a stove with a pipe running through the house, an ordinary dry.

14,874. Is it a pipe running through above?—It is above the floor, perhaps six feet.

14,875. Do you observe any difference in the men who change there and the others who go home to their houses, in getting cold or in getting off work from illness at all?—I do not.

Mr. George Henderson, Fallowfield Mine.

15,426. (*Chairman.*) Do the men change their clothes when they go down below?—Sometimes; not very often until they come home.

(F^{n}.) CHANGING HOUSES.

(F^{n}.) *Changin Houses.*

15,427. Is there any place upon the mine where they can change their clothes?—When they do change their clothes they change them in the engine-house.

15,428. In the boiler-house?—Yes; they hang their clothes by the side of the boiler to dry.

ROBERT WALTON BAINBRIDGE, Esq., Teesdale and Alston Moor Mines, &c.

16,309. (*Mr. Davey*) Have you any accommodation at the surfaces for the men to change?—Yes.

Mr. FRANCIS TAYLOR, Old Gang Mine.

17,591. (*Sir Philip Egerton.*) Are they in the habit of changing their clothes when they come out of the mine, or do they go home in their wet clothes?—They do not change them unless they be working in a very wet place; if they do, they perhaps carry a change with them, but we have none who are working who require that now.

Mr. THOMAS RAW, Surrender Mine.

17,681. (*Sir Philip Egerton.*) Are the men in the habit of changing their clothes after coming out of the mine before going home?—No.

17,682. Are there places where they could do so if they were so inclined?—Yes.

Mr. JONATHAN COATSWORTH, Keldheads Mines.

17,969. (*Chairman.*) Have you a changing house?—Yes, a sort of lodge and a fire in it at the level mouth; they leave their wet clothes there and have dry ones to put on.

18,052 (*Mr. Kendall.*) Most of those who work in wet places change at the mine?—Yes; when it it is very wet, and they get properly drenched. I made a place, and put a stove in, for that purpose.

Mr. HENRY DAYKIN, Grassington Mines.

18,476. (*Sir Philip Egerton.*) Have you any places appointed for them to change their clothes?—We had a place on purpose, since I have been agent here, and they would not use it.

18,476. Then they walk home in the clothes in which they have been working?—Yes, they do.

18,477. It is a very wet mine, is it?—No; it is a very dry mine.

18,478. There is not much drip from above?—No, not much. In sinking shafts or anything of that sort, there is dropping, but it is a very dry mine over head.

(G^{n}.) WAGES AND DEDUCTIONS.

(G^{n}.) *Wages and Deductions.*

Mr. JOHN BARRATT, Coniston Mines.

13,437. (*Chairman.*) What deductions are made from the men's earnings besides for the club?—Nothing. There is the house rent of those who live in cottages belonging to us.

13,438. Do the miners pay for candles and for powder?—Yes, and smith's cost.

13,439. For weighing the tools?—Yes, they pay for everything.

13,459. (*Mr. Kendall.*) As far as you are able to say are your wages higher or lower here than in other mines?—We are about the same here as at Furness.

13,476. What is the amount of the lump bargain?—It will amount to between 400*l.* and 500*l.* Six men will take that bargain, and then again in the stoping we let that sometimes for a bargain, and that will last four men 12 months. We say to them, "We will give you so much for cutting out the ground."

13,476 You deal with them in a large way?—Yes.

13,477. And you find that to answer?—Yes; there was a partnership in an eight months' bargain of four men, and they make 2*l.* a week by six months work.

13,478. Do you allow those men to increase the number of men working under them if they like?—We do not care.

13,479. Then they are contractors under you?—Yes.

13,480. Do they employ whom they like?—Yes. Indeed, we rather encourage it, as they will bring in strong country lads. It is all boring, but there must be one in the gang who has judgment. They will hire these young men for 14*s.* or 15*s.* a week, and they will bore as much as the best men in the mines Then it comes to this, that in, perhaps, six months, those young fellows will say, "I will now work for myself. I can cut the rock as well as you can."

13,481. On the average, how much per fathom do you give them?—It varies from 4*l.* to 10*l.* a fathom in levels.

13,512. (*Chairman.*) Have you stated the lowest wages that any man earns?—No. There may be a stranger who may not earn more than 12*s.* or 14*s.* per week, for a month or two.

13,513. What are the highest wages that a man may earn?—They have made as much as 30*s.* or 40*s.* a week, but we do not take them into the averages; they are exceptions. If we let a bargain for 500*l.* we do not consider that a fair case for an average.

13,514. (*Mr. Holland.*) What wages do the country labourers receive?—Half a crown or 3*s.* a day.

Mr. BENJAMIN PLUMMER, Goldscope Mine, &c.

13,627. (*Chairman.*) What are the men's earnings?—The average earnings will be from 15*s.* to 17*s.* a week; about 16*s* are what they are generally allowed.

13,628. What are the highest wages that a man may earn?—I have known them for a single month make as much as 30*s.* or 35*s.* a week, but that is not often the case.

13,629. How often are the miners paid?—They are paid once a month.

13,630. Is there a month's wages kept in hand?—Yes, it is so, or rather three weeks are kept in hand; we let the bargains on the last Saturday, and pay the third Saturday following.

13,631 Are the bargains let by competition or are they let for fixed prices?—They are fixed prices; it is not a public survey the same as in Cornwall or Devonshire, it is so small, as we measure up the last month's work; we let the work for the coming month as we go on, and if the men do not think the price will answer, they refuse it.

13,632. Is there no tribute work in your mines?—No

13,633. What deductions are made from the men?—For candles, smith's cost, steel, iron, shovels, powder cans, and powder.

Mr. JAMES POSTLETHWAITE, Keswick Mine.

13,789. (*Chairman.*) What do the men generally earn?—The underground men who are engaged in blasting earn 16*s.* per week; we have a few what we call skilled men who have 1*l.* a week, who look after the timbering and the dressing, but the ordinary men have 16*s.* a week.

13,829. Are the wages which you have stated clear of deductions?—Yes.

13,830. What are the deductions?—We provide tools, blasting powder, candles, and all material, which is all deducted from the men.

13,833. And for sharpening the tools they pay?—Yes; we have a stated price which we charge for the tools and sharpening as well.

Mr. WILLIAM PHILLIPS, Greenside Mine.

13,927. (*Chairman.*) What is the highest amount that any man can earn, or any set of men?—25*s* a week.

13,928 What is the lowest sum they can earn?—That depends upon how the bargain turns out; sometimes not more than 10*s.*, but I have known them to come as low as 8*s.*; not lower than that; sometimes the bargain goes against them, and at other times they get 20*s.* or 25*s.* or 18*s.*

13,929. Are the men principally young or old men?—There are both classes of men; those receiving low wages are generally older men; the young able men do not come so low as that.

13,954. What other deductions are there from their wages?—There is for the powder and candles.

13,955. And the tools?—The tools.

13,956. Do they pay for sharpening the tools?—No; they pay only for putting on the steel and repairing.

13,957. Are the tools weighed?—Yes; they are all weighed.

13,958. Have the men to pay for the wear and tear of the tools?—Yes.

13,991. (*Mr. Kendall*) Is there any difference in the amount of wages which they earn?—Of course the one gets standing wages, and the others work by contract.

13,992. Are the average earnings of the smelters the same as the wages of the others?—That is 20*s.* a week; the roasters earn 17*s.* 6*d.*, and the separators have 18*s.*

13,993. What are the average wages of the working miners?—About 16*s.* a week, from that to 17*s.* a week.

(G^{n}.) Wages and Deductions.

William Marshall, Esq., M.P.

14,156. (*Chairman.*) To what extent are the wages higher than those of the agricultural labourers of the district?—They earn 18*s.* a week, the work is constant; agricultural wages are higher in summer and lower in winter.

Mr. Tinniswood Millican.

14,272. (*Chairman.*) Do they pay also for sharpening their tools?—No, they buy their new tools first; we supply them and charge them so much for them.

14,273. Then the tools belong to the miners after that?—Yes.

14,274. If they should happen to leave the mine, would they take them with them?—No, they return them, and we give what they are worth.

14,275. Are they weighed then?—Yes.

14,276. Is no reduction made for wear and tear?—Yes, they generally get worse; we often repair the tools for the men, but we do not charge them for that.

Mr. Thomas Watson, Alston Moor Mines.

14,412. (*Chairman.*) What are the highest and the lowest wages that miners can earn in these mines?—Taking it for a quarter it sometimes happens that some of these partnerships speculate, and for three months they may make nothing, just for a trial; and in the next three months they perhaps may make 3*l.* a week.

14,413. During the first three months when they make nothing are they allowed anything?—We make them advances if the viewing party considers that the place is worth a trial and the men are justified in making such a speculation, and if it lasts 12 months they continue to them their advances.

14,414. What are the allowances that are made to them under such circumstances?—2*l.* 4*s.* per month to each man.

14,415. Do the allowances take place regularly?—Yes; when the young men go in we generally give them 35*s.* a month during the first quarter; and from the end of the first quarter till they are 21 years of age, or until they are 20, we generally give them 2*l.* a month, from the age of 20 to 21, and 2*l.* 4*s.* for two out of every three months, and 2*l.* the third month; that is our general way; of course there are exceptions; some men are working with their friends.

14,443. (*Mr. Davey.*) What are the average wages in your mines?—A good man, taking it for 12 months would make from 18*s.* to 20*s.* a week.

Mr. Thomas Wilson Crawhall, Rodderup Fell Mine.

14,558 (*Chairman.*) How are the men paid?—We advance them 2*l.* a month, and they are paid off annually.

14,559. How much do the men earn; what are the highest wages?—Perhaps some partnerships may make 70*l.* or 80*l* each man in the year, that is amongst the highest; we generally have some who make about that.

14,560. And what would be the lowest?—Some of them might be as low perhaps as about 20*l.*, but that is rare, because those are the extremes; our men will commonly make 40*l.* or 50*l.* a year clear.

14,561. From 18*s* to 1*l.* a week?—Yes.

14,568. For tools how do you manage; do you supply tools, or do they supply them?—We partially do so; we sharpen the tools, and they get some portions of tools from us and partly they get them elsewhere.

14,569. Are they charged for sharpening the tools?—No.

14,572. There are no deductions for club money?—None whatever; there are no deductions excepting for school; they pay 6*s.* a year each workman.

14,604. (*Mr. Kendall.*) What are the average wages among your men?—They make about 18*s.* or 20*s.* a week.

Mr. Josiah Remfry, Derwent Mine.

14,918. (*Chairman.*) What can tut-work men earn generally at the bargains which are let?—On the average say 15*s.* per man for 40 hours working; that is five eight hours.

14,921. What can a tributer earn generally?—We have some that earn a good deal and some that earn scarcely anything at all.

14,922 To those who do not earn anything do you grant subsist?—We do.

14,923. How much?—From 40*s.* to 50*s.* per month, according to the industry of the person, the labour that he has done and so on.

(G^{n}.) Wages and Deductions.

14,924. Then before granting subsist you get a report from the agent as to the amount of work which the man has done?—Yes, and the quantity of ore that he may get in the time; on the whole I should think that the tributers will earn a little more than the tut-work men.

14,925. Do many for a time earn nothing?—Yes.

14,926. That would not be the case with the tut-work men?—No, they would not earn nothing, because they generally get something, although the bargains vary.

14,927. What is the lowest that a tut-work man who gets a bad bargain earns?—I should think that the lowest which has come under my notice for a considerable period will not be less than 30*s.* in the month.

14,928. Has that continued for any time?—Very seldom.

14,929. The bargain has only been for a month?—Probably for half a month or a month, as the case may be; sometimes we let our bargains for a month, but generally speaking, we give them a certain stint, two or three fathoms, and they may have a second or probably a third bargain too in the month.

Mr. Thomas Morpeth, Derwent Mine.

15,085. (*Mr. Kendall.*) With regard to the wages, do you make any difference between the wages of the married men and the wages of the single men?—It makes no difference to us, we let all the bargains as nearly as possible alike, and they may make what they can; it is no matter whether a man is a married man or a single man.

15,086. According to his worth so he has his money?—Just so.

15,087. What are the average wages?—I think the average wages this last month have been about 15*s.* 2*d.* a week at this low level, or 15*s.* 2¼*d.*

15,088. You do not know the agricultural wages here, do you?—I do not.

Mr. Thomas Ware, Stone Croft and Grey Side.

15,317. (*Chairman.*) Do the miners pay anything for the sharpening of their tools?—No; we do not charge anything for that. We provide the tools, and they pay for short weight. They are weighed in once in two months, and we deduct for short weight.

Mr. George Henderson, Fallowfield Mine.

15,448. (*Chairman.*) Are the tools weighed?—Yes; they are weighed.

Mr. John Ridley, Coalcleugh Mine.

15,471. (*Chairman.*) Are the bargains let quarterly?—Quarterly.

15,472. Is so much kept in hand on the pay day?—Yes; the subsistence is 40*s.* per month, and the balance is paid over to them once in a half year.

15,473. But the bargains are quarterly?—The bargains are quarterly

15,474. (*Mr. Austin Bruce.*) Do they get any other advance except the subsistence of 40*s.* a month?—No; some parties sometimes apply for a little more in case they stand in need, and in those cases it is never refused when a man is in needy circumstances; but very few of the men ever ask for such a thing.

15,475. (*Chairman.*) Then all the men get it equally?—Yes; 40*s.* per month.

15,476. What happens if, at the end of the half year, they have not earned that amount?—They go into arrear.

15,477. Is that deducted off the following half year?—Mr. Beaumont arranges it in this way: supposing that 5*l* is in arrear, 50*s.* is struck off, and 50*s.* goes on to be deducted in the next half year, in case the man has earned it.

15,478. Whatever the arrear is Mr. Beaumont strikes off one half?—Yes; it is lost sight of altogether.

15,479. Does that occasionally happen?—Very seldom; sometimes.

Robert Walton Bainbridge, Esq., Teesdale and Alston Moor Mines, &c.

16,201. (*Mr. Kendall.*) What was the average?—It was 2*d.* below the basis, it was 14*s.* 10*d.*; occasionally it will come out some 2*d* or 3*d.* or 6*d.* above the basis.

16,202. (*Chairman.*) Is that for working by the fathom?—By both weight and fathom; we have two systems, one is to pay them by the amount of ground cut, and the other to pay them by the amount of ore raised.

16,203. What proportion should you say that the men

(G^{n}.) WAGES AND DEDUCTIONS.

(G^{n}.) *Wag and Deductions.*

in this district are paid by the amount of ore raised, and what proportion by the fathom?—I should say that three-fourths of the miners are paid by the amount of ground cut in this district; we are guided in that respect very much by the state of the vein, whether it is a wide or a narrow vein, or otherwise.

16,204. When the payment is made by weight, is the value of the ore taken into consideration?—No, not the market value of the ore, the simple weight.

16,268. (*Chairman.*) What deductions are made from the miners?—For candles, gunpowder, and tools.

16,269. Are the tools weighed?—Yes, they are weighed to the men; we charge them so much per pound for the tools, and we charge them for the drawing of the work out of the levels, that is paid by the men as part of the bargain, and deducted out of their earnings.

16,349. (*Mr. Kendall*) The balance beyond the 11*s.* a week is paid up at the end of every year?—Yes.

16,350. Do you think that the sums of money which the men receive then lead them to invest in small farms, and buying stock for farms?—Yes.

16,351. Then you think that their receiving a balance at the end of the year is more beneficial than their receiving so much more money a week?—Yes, I do. It comes to meet those annually accruing charges which they cannot escape, and our retaining the money in our own hands I believe is better than if they had it in their pockets, in many cases.

16,352. You find that very frequently these balances are invested in cows and so on?—Yes, and in the building of cottages. I think you ought to know that at our mine shops we always provide a cool pantry for the keeping of the men's provisions, and we always provide a flow of water where they can insert their cans or bottles of milk so as to keep them fresh for several days, and in each of those mine shops there is a flow of water so that they can wash themselves.

Sir GEORGE WILLIAM DENYS, Bart.

17,374. (*Mr. Holland.*) They are paid at the end of March for the March work?—Always; a man may have a bargain that will last a year, but he is paid every month for what he has got during that month, subject to deductions for candles and powder and drawing; the men pay for the work being drawn out of the mine, and the washing of it.

Mr. ROBERT DAYKIN, Hurst Mine.

17,437. (*Chairman.*) What are the deductions which are made in the men's wages?—They pay for their own candles, powder, tools, and the drawing of their work to the bank; but we charge them only a little more for these things than what they cost us.

Mr. THOMAS RAW, Surrender Mine.

17,644. (*Chairman.*) Do you pay the men?—Yes.

17,645. How often are they paid?—Monthly.

17,646. Both classes of men, whether they are working by bing or by fathom?—Yes. We make our pays monthly —12 in the year.

Mr. GEORGE A. ROBINSON, Grinton Moor Mine, &c.

17,809. (*Chairman.*) What do the men now earn generally?—The mines are poor. In some of the mines they will average about 10*s.* a week, in some about 15*s.*, and in others from 16*s.* to 18*s.*; in one mine I consider that the average is about 10*s.*

17,810. Why is that?—Because they have too great partnerships. I consider that to be one of the great faults in mining.

17,811. Can these men who merely earn 10*s.* a week on the average maintain their families properly upon that sum?—No.

17,812. Can they get the proper food for the hard work? —They get it, but they cannot pay for it.

17,813. Do the miners live well upon the whole?—They do not live as they ought to live.

17,814. Do they consume much animal food?—Yes; a fair proportion of that, but they do not use it in the best way, they do not understand cookery.

17,815. Are they fond of having good dinners once now and then, and then living very moderately afterwards, or how; for instance, will they have a very good dinner on a Sunday and stint themselves on other days of the week?—No, they do not do that, but supposing that a man gets what we call a hit, if he makes an extra amount he lives like a fighting cock as long as it lasts, especially in rich cakes, and all that sort of thing, you would be surprised to go and see them sometimes in that way, but they are steady livers on the whole as far as regards meat.

17,816. Do they drink much?—Not one fourth of what they did.

17,817. They are very much improved?—Very much indeed.

17,818. Are there many teetollers amongst them?—Yes.

17,825. How often are the men paid?—Every month. I believe that one of the great advantages which we have had here, has been in making our pays monthly, formerly they used to be quarterly. When they were made once a quarter the men were over head and ears in debt, and on the pay days they would meet and they would drink for a week or a fortnight before ever they struck another bat.

17,826. Are the pays made at public houses?—No; another advantage is that all the pays now, without an exception, are made apart from public houses; I believe that the whole of them are apart from them.

Mr. MATTHEW NEWBOULD, Sunside Mines, &c.

18,230. (*Chairman.*) And you clear off every month?—Yes.

18,231. (*Mr. Holland.*) Are they paid for the current month?—For instance, we clear off about the end every month, and we pay them on the third Wednesday in every month.

18,232. For the previous month?—Yes; for February we shall pay on the third Wednesday in March; we only keep about a week in hand.

(d^{n}) MONTH IN HAND.

(G d^{n}.) *in Hand.*

Mr. JOHN BARRATT, Coniston Mines.

13,442. (*Chairman.*) In paying wages, is it your practice to keep a month in hand?—It is like a month in these bargains, with respect to the men on contract or tut-work; but they have 9*s.* a week subsist if the wish it. A great number do not wish to have it, and they will wait for their balance; but there is a month in the bargain; in the day-work there is only a week.

Mr. JAMES POSTLETHWAITE.

13,788. (*Chairman.*) Dou you keep a month in hand? —Yes.

Mr. WILLIAM PHILLIPS, Greenside Mines.

13,925. (*Chairman.*) How often are the men paid?—We sub every month and pay the balance up every three months; the sub is 2*l.* per month.

13,926. Do you not keep a month in hand?—No; we balance up at the three months end; they will work a week or so with a new bargain; but that does not interfere with it.

Mr. THOMAS WARE, Stone Croft and Grey Side Mines.

15,308. (*Chairman.*) Do you let your bargains by the month or by the quarter?—By the month, so many fathoms, or a month.

15,309. Have you any tribute-men?—No.

15,310. In paying the men do you keep so much in hand?—We keep a week in hand until we can get our accounts made up.

(f^{n}) PAYING IN NOTES.

(G f^{n}.) *Paying in Notes.*

Mr. GEORGE A. ROBINSON, Grinton Moor Mine, &c.

17,827. (*Mr. Holland.*) Is each man paid separately his full amount?—They are paid in partnerships and they divide.

17,828. Do they divide at public houses?—No.

17,829. How do they manage that?—In some places they will go to the public house. but in my own case I always have sufficient change sent up to each of the mines so that the men have no occasion to go for change to any place; they can divide the money there and then.

17,830. Is there any rioting on the pay day?—No, I never see anything of the kind; there is a little extra drinking higher up I believe, but not of any great consequence.

(h^{n}) PACKMEN.

(G h^{n}.) *Packmen.*

Mr. THOMAS COATES, Arkindale and Fell End Mines.

17,312. (*Mr. Kendall.*) And they pay 8*s*?—Yes; but it does not make any difference to them about paying the 8*s.* I am talking now as a miner. I have never been married, and I have had my candles myself to sell. If I am working with three or four married men and there are

(G^{n}.) WAGES AND DEDUCTIONS.

(G h^{n}.) *Packmen.*

single-handed men as well as me, I have not a house to find candles for but those married men have; and they have a wife, and when the packman comes round she wants something, and she will give a penny candle for half a farthing's worth of thread, they must take what they can get for them.

(G i^{n}.) *Condition of Miners.*

(i^{n}) CONDITION OF MINERS.

Robert Walton Bainbridge, Esq., Teesdale and Alston Moor Mines, &c.

16,284. (*Mr. Austin Bruce.*) How early did you become connected with these districts, by occupation?—At about two or three and twenty years of age.

16,285. Since that time have you observed any change in the physical condition of the workmen?—My impression is, that upon the whole, it has been improving; mainly from this fact, that during the preceding 20 years the mines underwent a general improved ventilation? then by the time that I came here those who had suffered previously to the previous 20 years from a comparative defect of ventilation were dying out.

16,286. In the last 20 years have there been also improvements introduced in ventilation?—No; I really cannot say so. My impression is that my predecessor paid equal attention to that as I have done myself.

16,287. Have there been any improved modes of introducing fresh air or extracting the foul air within your recollection?—No; we still have recourse to the water blast and the fan blast which were in operation above 20 years ago.

(G j^{n}.) *Bargains.*

(j^{n}.) BARGAINS.

Mr. Tinniswood Millican.

14,311. (*Mr. Davey.*) What is the manner in which you let your bargains?—We have what are called viewing agents, and they all go into the mines and take a view, and make their statements of what they think a place ought to be worked at per fathom. They give that to our superintendent, and he fixes the rate.

14,312. The miners work within a certain limit; you fix the price, and they have the opportunity of changing a place if they like?—Just so. We have three districts, and when the mines are viewed the agents come from the two other districts, it keeps us clear from having any corruption amongst us. And we all give independent opinions, so that we cannot cheat anyone.

Robert Walton Bainbridge, Esq., Teesdale and Alston Moor Mine, &c.

16,184. (*Chairman.*) Are the bargains of the mine let quarterly?—Yes.

16,185. Do the men receive any monthly allowance?—Yes; merely subsistence, and the balance is paid at the end of the year.

16,186. What is the monthly allowance made to the miners?—44*s*. per month, or 11*s*. per week.

16,187. If a man gets into arrear, is that carried on into the next year?—Yes, we carry the balance on against him to the next year.

16,188. (*Mr. Austin Bruce.*) The whole of it?—Yes, we always carry the whole of the balance on against him.

16,189. (*Chairman.*) Does it often happen that there is a balance against a man?—No, no by means; decidedly the minor portion of our men have no balance: by far the larger proportion have a balance to receive at the end of the year.

16,190. (*Mr. Austin Bruce.*) On what theory of wages are the bargains made; what is it expected that a man may fairly earn?—Our basis is 15*s*. a week clear, for five eight-hour shifts; but the basis fluctuates according to the state of the times, and according to the price of provisions.

16,191. (*Mr. Kendall.*) If there is a balance against a man, is that carried on into the next year?—Yes, invariably.

16,192. (*Chairman.*) Will you describe to the Commissioners the way in which the ground is valued when you make the bargains?—As between the masters and the men our system is this:—we send not fewer than five agents to each working, throughout the whole of the mines; and, generally speaking, I have two sets of five agents going on with their view at the same time, and that is done with the object of saving time of the men. Formerly one set of agents used to view all the mines, and it took them a fortnight to complete their work in this district; but for some years past, instead of having one set of agents going, I have had two sets to view, and we are able to accomplish all our bargain arrangements within a week. As a general rule, the men do not work at the time that the view is going on, so that we have a loss of time, a loss of time to the masters, and a loss of time to the men also; and, with the view of occasioning to both the Lead Company and the workmen the least possible loss of time, I now accomplish all the views and the bargain-letting within a week in each of the districts. I have two sets of men who travel, and to each of these sets I give its own peculiar department; that is to say, I would send five to one mine on one day, and five to another mine on the same day; and these agents are not exclusively the local agents, but they are drawn from the different districts. I should have all our Teesdale agents travelling, and I should have agents from Alston Moor, from Westmoreland, and from Weardale, mingling the home agents and the stranger agents together; and in that way all possibility of partiality, and all possibility of any improper dealing between the local men and the miners is prevented. To each of these parties I give the basis of the wages upon which they are to give their opinion, so as to bring out the net earning of 15*s*. a week to each man, for five eight-hour shifts of free and skilful exertion. Then, having that basis, each of those parties goes to a mine and views the place, and considers what the rate ought to be for the bargain, and he enters that in his own book or sheet, which he delivers to me independently of his fellows.

(G j^{n}.) *Bargains.*

16,193. Do they not consult together?—I presume they may in some cases of difficulty, or where it is desirable that they should be possessed of local information, they may in some cases talk with each other; but, as a general rule, they do not. Supposing that the local agent may be presumed to have better knowledge than any stranger, I conceive it to be his duty to bring under the notice of all his fellows everything that he conceives they would not be acquainted with without his communication to them.

16,194. The object, I presume, is to obtain independent opinions; and, upon the whole, you think you obtain them?—Yes; as a general rule I believe they do not consult. I do not conceive that it is improper that they should consult on some particular occasions.

16,195. Has this system been in operation for some time?—Yes, before I came into the concern. I apprehend that it has been in operation for the last half century.

16,196. Supposing there should happen to be a great difference of opinion, what is done then?—Then I have to arrange it myself. After I have obtained all their opinions, I then form my own figures, founded upon their opinions; and my own practice generally is this: I take the figures and add them together, and divide by five; or I take the highest and the lowest, and take the mean between the two; then I look to the parties in whom I have the greatest confidence, to see how their figures bear upon that, and I fix my own accordingly. I exercise my own judgment, guided by the judgment of those different parties. I am not bound by those figures, but I use their judgment in forming my own.

16,197. Has this system worked beneficially with reference to the owners of the mine?—I conceive that it has

16,198. Has it given satisfaction also to the men?—Yes, it has; no system could possibly be devised that would keep the agents more independent of the men, or the men more independent of the agents; supposing that a local agent had a pique against a partnership, his pique would be corrected by the opinions of the others; or supposing that he had any favouritism towards them, then his favouritism would be corrected by the independent opinions of the others.

16,199. And upon the whole it has given satisfaction?—Yes, decidedly so; I believe that both the masters and the men are thoroughly satisfied, and that the judgment thus formed is sound; I may state that the results generally come out very closely approximating to the basis that I have given.

(G k^{n}.) *Small Workings.*

(k^{n})—SMALL WORKINGS.

Mr. Joseph Michell Paull.

14,801. (*Mr. Kendall.*) What is generally the length of time that they are let for?—The smaller mines are sometimes let for six months, but they are renewable at the end of every six months. We have some mines that have been working for a considerable time upon a take-note of six months. I renew them at the end of every six months. They are first granted by the receiver, but if the parties wish, they can have a lease of 21 years.

14,802. Do they pay for the take-notes?—No; the take-notes are, generally speaking, granted to working men; they apply for a take-note, and they get a length of 1,200 yards on a certain vein, and 40 yards on each side.

(G^n.) WAGES AND DEDUCTIONS.

(G I^n.) *Tools*

(I^n)—TOOLS.

Mr. John Ridley, Coalcleugh Mine.

15,498. (*Chairman.*) Do you supply the tools?—They are supplied at the works, but they buy them.

15,499. Then the tools are not weighed for loss of weight?—They buy them at first, they buy them sometimes by the dozen, and wear them down until they are a certain length, and then get two of them welded together.

(I^n.) CANDLES.

(I^n.) *Candles.*

Mr. John Barratt, Coniston Mines.

13,440. (*Chairman.*) What do you charge the miners for candles?—I think they charge the men 7*s.* a dozen pounds; it is a uniform rule. If we departed from it we should have a constant alteration in the price. We buy the candles for 6*s.* a dozen pounds, perhaps, and we charge the men 7d. a pound. It is the same as to the powder; we keep to one rule. If we did not, upon every bargain day we should have to calculate, and say, "the men's cost will be so much less, or so much more."

13,441. Could they not get their own candles elsewhere?—No, they could not supply themselves; they have no credit, and they must come to us for the money.

Mr. William Mitchell, Coniston Mines.

13,530. (*Chairman.*) Do the miners receive a certain allowance of candles per week?—Every man receives 2 lbs. a week.

13,531. What do the miners pay for the candles?—They pay 7*d.* a pound; that is the mine charge.

13,532. Do they consume the whole of the 2 lbs. of candles so supplied to them per week?—We do not know that; they are allowed to take them if they do not use them.

Mr. Benjamin Plummer, Goldscope Mine, &c.

13,634. (*Chairman.*) What do they pay now for candles?—They pay 9*d.* a pound at this present time.

Mr. James Postlethwaite, The Keswick Mines.

13,831. (*Chairman.*) What do they pay for candles?—7*d.* a pound.

Mr. William Phillips, Greenside Mine.

13,950 (*Chairman.*) What quantity of candles do you allow to the men?—Any quantity that they may require; sometimes four men will burn perhaps six dozen pounds and sometimes seven dozen pounds in a quarter; but that just depends upon the work or time which they may work.

13,951. What do you charge them for the candles?—7*s.* a dozen pounds; sometimes 6s. 6d.

13,952. According to the contract price which you pay for them?—Yes.

13,959. Do they ever dispose of the candles, or take them home?—I do not know anything about that.

13,960. As they pay for them, you are indifferent about it?—We supply them with candles and powder and charge them for them, and whatever they do with them is for themselves to look to; we give them a fair valuation for cutting the ground.

Mr. Tinniswood Millican.

14,265. (*Chairman.*) What allowance of candles do you make to the miners?—They use what they require.

14,266. What do they pay per pound for the candles?—We pay about 8*s.* I believe it was 7*s.* 10*d.* a dozen last year.

14,267. Are the men charged the same price as you pay for them?—No, we take an average of the price.

14,268. Do you mean an average over 12 months?—We have different districts belonging to the lead company; there is the Teesdale mining district, and the Westmoreland mining district, and we strike an average of the rates, and charge the men accordingly.

14,269. At that average price the men are supplied with candles?—Yes, on that average price we fix the rates at what we think they ought to pay.

14,270. How often is that average struck?—Once a year.

Mr. Thomas Watson, Alston Moor Mines.

14,416. (*Chairman.*) What do the miners generally pay per pound for candles?—We always deduct the price of candles annually, when we settle the annual accounts.

14,417. The charge for candles and powder is all settled annually?—Yes.

Mr. Thomas Wilson Crawhall, Rodderup Fell Mine.

14,564. (*Chairman.*) Are the men allowed a certain amount of candles?—They get whatever they require, they pay for the candles

14,565. What do they pay a pound for the candles?—We generally put a fixed price of about 8*s.* a dozen, and we keep a stock at the mine, and they come every Monday and get whatever candles they may require.

14,566. May they bring their own candles if they like?—Yes, they may get them anywhere they like.

14,567. (*Mr. Holland.*) Is that about the retail price in the district?—Perhaps a trifle more, we generally put such a price as not to have to vary, the men prefer that, and then they know exactly what they are paying; if they like to get them elsewhere there is nothing whatever to prevent them. In reckoning for the men we deduct the candles or the gunpowder which they have.

Mr. Josiah Remfry, the Derwent Mine.

14,930. (*Chairman.*) What deductions besides the money for the club do the men pay. Do they pay for powder?—Yes, and for candles.

14,931. What do they pay per pound for candles?—8*d.* per pound.

14,932. And for powder?—The same.

14,933. Are they limited in the quantity of candles?—Yes.

14,934. How much is allowed them?—A pound and a half per man, except (and that is frequently), where the air blows the candle much, and then they are obliged to have more.

Mr. Thomas Ware, Stone Croft and Grey Side.

15,313. (*Chairman.*) What allowance of candles is made to the men?—We do not allow them more than 2 lbs. a week; some of them do not get more than a pound a half, just what they look for.

15,314 What do they pay per pound for the candles?—6*s.* 6*d.* a dozen pounds; sometimes 7*s.* We charge them just what we contract for. If they are high we charge 7*s.* a dozen pounds, if they are lower we charge them less.

Mr. George Henderson, Fallowfield Mine.

15,445. (*Chairman.*) What do the men pay for candles?—Just what they cost; we find them with the candles and they are charged the same as they cost.

Mr. John Ridley, Coalcleugh Mine.

15,500. (*Chairman.*) Do you supply candles?—No, they buy their candles as well, and gunpowder.

15,501. What do they pay a pound for the candles?—Mr. Beaumont buys the candles, and they are charged just what he pays. They are charged to the miners at 6*s.* or 6*s.* 2*d.* a dozen.

15,502. And gunpowder the same?—Yes.

Robert Walton Bainbridge, Esq.

16,272. (*Chairman.*) What do the miners pay per pound for candles?—That varies according to the price; we charged them last year about 7½*d.*

16,273. Are they charged anything beyond the contract price?—Yes, something to cover the agent's trouble, and everything of that kind.

Mr. Thomas Coates, Arkendale and Fell End Mines.

17,300. (*Chairman.*) Where do you get your candles?—We make them ourselves. I have brought some with me.

17,301. Why do you make them yourselves?—Because we can make them better.

(*The witness produced some candles.*)

17,302. In making the candles do you mix anything with the wicks besides cotton?—There is nothing that I am aware of but the bare cotton.

17,303. You do not think it necessary to mix flax or tow in the wicks?—I think that that we cannot put in so good a thing as is in them.

17,304. Have you ever seen a candle the wick of which has been mixed with cotton and tow?—Never in my life.

(I^{n}.) *Candles.*

(I^{n}.) CANDLES.

(I^{n}.) Cand

17,305. (*Mr. Kendall.*) Are the candles made of Russian tallow?—Russian and American; both North and South American, I believe.

17,306. There is no English tallow?—None.

17,307. You charge 8*d.* a pound for the candles?—Yes.

17,308. What does it cost you?—6*d.*, and sometimes a fraction more.*

17,309. Do you limit the men in quantity?—We deliver them out once a week.

17,310. Do you limit them?—Yes, rather, or else they would sell them; we allow them six pounds a month.

17,311. What do they sell at?—They will sell them at 3*s.* and 4*s.*

17,312. And they pay 8*s.*?—Yes; but it does not make any difference to them about paying the 8*s.* I am talking now as a miner. I have never been married, and I have had my candles myself to sell. If I am working with three or four married men and there are single-handed men as well as me, I have not a house to find candles for but those married men have; and they have a wife, and when the packman comes round she wants something, and she will give a penny candle for half a farthing's worth of thread; they must take what they can get for them.

17,313. (*Chairman.*) But the man who makes them or the owner of the mine does not lose?—No.

Mr. Robert Daykin, Hurst Mine.

17,438. (*Chairman.*) What do they pay for candles?—8*s.* a dozen.

17,439. Where do you buy them?—In Richmond.

17,440. What do you pay for them?—I think somewhere about 5*s.* 6*d.* at present; but they have been more.

17,441. Are you particular as to the quality?—Always; we have them 12 to a lb., and with a good wick.

17,442. Have you ever had to return them from the quality not being good?—Sometimes, but they are generally good candles. They know near about what we want.

Mr. Francis Taylor, Old Gang Mine.

17,547. (*Chairman.*) What is the price which the men pay for the candles?—They pay 8*s.* a dozen lbs. with us—8*d.* a lb.

17,548. Where do you get them?—Our company make them; they buy their own tallow and employ a tallow chandler.

17,549. Do you know at what cost they can be had in that way?—I do not.

Mr. Thomas Raw, Surrender Mine.

17,647. (*Chairman.*) What do the men pay for candles?—8*s.* per dozen.

17,648. Where do you get them?—We make them ourselves.

17,649. Do you think that a good plan?—I do.

17,650. Why?—We buy first-rate tallow and get a good wick and pay a tallow chandler so much per dozen for making the candles, and then we think that when he has good material to work upon he will put forth good stuff.

17,651. What do they cost per dozen?—I am not aware of the cost of the tallow, but perhaps 5*s.* 6*d.* or 5*s.* 8*d.*; I think that it stands at that at present.

17,652. You think that to ensure a good material for the candles is important?—I do. When the air is bad in a mine and the men have a candle burning made of bad material where they are breathing I think that it is pernicious to their health, and I think that it is beneficial to their health to have good candles.

17,653. Do you mix anything with the cotton?—I believe that it is pure cotton.

17,654. Does it give light enough?—Yes; quite sufficient light.

Mr. Matthew Newbold, Sunside Mines, &c.

18,157. (*Chairman.*) What do they pay for their candles?—We generally charge them according to the price we give, sometimes it is lower and sometimes higher.

18,158. What is about the present price?—6*s.* 6*d.* a dozen.

18,159. Where do you get them from?—In the neighbourhood.

18,160. Do you contract for them?—Yes; we buy them every month.

18,161. (*Mr. Kendall.*) Do the men pay 6*s.* 6*d.*?—Yes.

18,162. What do you give?—6*s.*; we generally charge about a halfpenny a lb. more, just to keep them below the retail price; if we charged them only 6*s.* they might make a trade of it.

18,163. (*Chairman.*) Are they limited to a certain amount?—No, they have any quantity which they require.

Mr. William Barron, Craven Moor.

18,261. (*Chairman.*) Is a deduction made from the men for candles and powder?—We let the contracts and keep a store and find all these things, and we take it off their money, but we calculate powder and candles. Not in average of wages.

18,262. What have the men to pay for candles?—7*d.* a lb., and 7*d.* a lb. for powder.

Mr. Joseph Broad Champion, Merryfield Mine.

18,387. (*Chairman.*) What do they pay for candles?—7*d.* a lb. as a general rule.

Mr. Thomas Job, Hebden Moor.

18,582. (*Chairman.*) What do the men pay for candles at Hebden Moor?—About 7*d.* a pound.

(J^{n}.) *Powder*

(J^{n}.) POWDER.

(J^{n}.) P

Mr. Benjamin Plummer, Goldscope Mine, &c.

13,635. (*Chairman.*) How much do they pay for powder?—8*d.* a pound.

Mr. James Postlethwaite, Keswick Mines.

13,832. (*Chairman.*) And what for powder?—8*d.* a pound.

Mr. William Phillips, Greenside Mine.

13,953. (*Chairman.*) And what do they pay for the powder?—That is the same; we charge them 14*s.* for a quarter of a cwt.

Mr. Tinniswood Millican.

14,266. (*Chairman.*) What do they pay per pound for the candles?—We pay about 8*s.* I believe it was 7*s.* 10*d.* a dozen last year.

14,267. Are the men charged the same price as you pay for them?—No, we take an average of the price.

14,268. Do you mean an average over 12 months?—We have different districts belonging to the lead company; there is the Teesdale mining district, and the Westmoreland mining district, and we strike an average of the rates, and charge the men accordingly.

14,269. At that average price the men are supplied with candles?—Yes, on that average price we fix the rate at what we think they ought to pay.

14,270. How often is that average struck?—Once a year.

14,271. Do they pay for powder in a similar way?—Yes.

Mr. Josiah Remfry, Derwent Mine.

14,931. (*Chairman.*) What do they pay per pound for candles?—8*d.* per pound.

14,932. And for powder?—The same.

Mr. Thomas Ware, Stone Croft and Grey Side Mine.

15,315. (*Chairman.*) What do you charge them for powder?—16*s.* for what we call a quarter barrel of 25 lbs.

15,316. Does that vary according to the contract price?—Yes.

Mr. George Henderson, Fallowfield Mine.

15,445. (*Chairman.*) What do the men pay for candles?—Just what they cost; we find them with the candles and they are charged the same as they cost.

15,446. Is there a fixed allowance per week to the men?—No; they take what they find necessary to use, some men who are working not on contracts are allowed a certain quantity per week, in addition to their wages; but in the case of the men who have contracts, they take what

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* This difference in the cost price and price charged enables the masters to give the cost of the candles and powder to such of the miners as do not make wages and are unfortunate in their trials.—K. M. Jaques.

Powder.

(J^{n}.) POWDER.

(J^{n}.) Powder.

quantity they choose, and we deduct the amount from their accounts.

15,447. And is the practice the same with regard to the powder?—Just the same with the powder.

Mr. John Ridley, Coalclough Mine.

15,500. (*Chairman.*) Do you supply candles?—No, they buy their candles as well, and gunpowder.

15,501. What do they pay a pound for the candles?—Mr. Beaumont buys the candles, and they are charged just what he pays. They are charged to the miners at 6*s.* or 6*s.* 2*d.* a dozen.

15,502. And gunpowder the same?—Yes.

Robert Walton Bainbridge, Esq., Teesdale and Alston Moor Mines, &c.

16,274. (*Chairman.*) Is it the same with regard to the gunpowder?—Yes, and I may say that they pay that with this view: the men, if they had these things too cheap, would be wasteful, and it is not desirable that we should be below the country price.

16,275. They do not pay anything beyond the country price?—No, I do not conceive that they do in general; I believe that we are below the retail price of the country.

16,276. Are the miners limited to a certain quantity?—No; I hold it to be the duty of the overlooker to see that there is no waste; and I always cause to be hung up in the office a list of the quantity of powder and candles that each partnership has been supplied with during the preceding quarter. That is ostensibly in order that the men may have information of how our accounts stand; but really as well that the men may be mutual checks upon each other, as to the use and the waste of candles, and it does operate in that way.

16,277. As they pay for them, it is for their own advantage that they should not consume more than is necessary?—Of course, we intend that our men should earn a net sum after the deductions for these things are made, and if they are wasteful, then the charge comes upon the Company as it were.

Mr. Francis Taylor, Old Gang Mine.

17,550. (*Chairman.*) What do the men pay for the powder?—6*d.* a lb.

Mr. Matthew Newbould, Sunside Mines, &c.

18,164. (*Chairman.*) What do you charge them for the powder?—We generally charge from 16*s.* to 18*s.* to a quarter barrel, cost price from 50*s.* to 56*s.* per barrel 100 lbs., of course, the price of powder goes up and down; powder has been rather lower of late, but we have not reduced the price.

Mr. William Barron, Craven Moor.

18,262. (*Chairman.*) What have the men to pay for candles?—7*d.* a lb., and 7*d.* a lb. for powder.

Mr. Joseph Broad Champion, Merryfield Mine.

18,388. (*Chairman.*) And how much for powder?—9*d.*

Mr. Thomas Job, Hebden Moor Mine.

18,583. (*Chairman.*) How much for powder?—About 3*l.* a hundredweight.

Clubs.

(K^{n}.) CLUBS.

(K^{n}.) Clubs.

Mr. John Barrett, Coniston Mines.

13,381. (*Chairman.*) Is that a club for the purpose of affording relief in sickness, or in case of accidents?—Merely for accidents.

13,382. If a man meets with an accident from his own fault, as I understand you, he does not obtain any relief?—The rule is that he should not obtain any; but he does, notwithstanding that, get what we can do for him.

13,383. Do you keep a separate account of the club money?—Yes, we keep a distinct account.

13,384. What do the men contribute towards the club? The men contribute 1*s.* per month, and the boys who are in receipt of 12*s.* per week, contribute 9*d.* per month. Those boys who receive only 10*s.* per week contribute only 6*d.* per month, and other boys, who receive only 5*s.* per week, pay only 4*d.* per month.

13,385. Relief is given only in cases of hurts?—Yes, and pensions are given; we have several pensioners.

13,386. Do you give a pension to a man who has received a hurt and is unable to work?—Yes, about 5*s.* a week; at the present time we give that to two men, and there are two or three women with families, whose husbands lost their lives five or seven years ago, and we continue to give a pension of 3*s.* a week to those women.

13,387. Are the contributions made to the club by the miners sufficient to meet all the demands upon it?—Yes; there is a balance at the present time of about 70*l.* in hand.

13,388. Do any of the miners belong to benefit clubs?—All of them.

13,389. Do you make any difference in the allowance made from your club in such cases;—Yes; there is one man who was hurt some years ago and he gets 2*s.* 6*d.* a week, but he receives 9*s.* a week out of his club.

13,390. From his own benefit society he receives so much, and in that case the allowance made to him from your club is less than usual?—Yes; we have only one case of that sort. That is the only case I have known.

13,391. Suppose that a man was receiving an allowance from his own benefit society, should you, generally speaking, make any difference in the allowance you made to him?—Yes, we should after he could walk about, but not before. We have employed two men to wait upon them, and they did so for a month or six weeks in one case. We provide everything that the doctor recommends; whatever he recommends we supply. It is entirely left to the doctor, and the doctor is not appointed by the men, but by us. He has a fixed salary, not at all dependent upon the club. We found that the other system did not answer, for the men were constantly holding factious meetings, and we then said, "We will appoint a doctor, and if he does not "give you satisfaction it will be time then to dispute the "matter." But the men had repeatedly chosen them, and there was a general feeling among them that we should soon remove the doctor.

Mr. Benjamin Plummer, Goldscope Mine, &c.

13,638. (*Chairman.*) Have you a sick club?—Yes.

13,639. Is assistance afforded in case of visible accidents or sickness?—For both.

13,640. What do the men contribute to the club?—1*s.* a month.

13,641. What is allowed to them when they are sick?—They are allowed 8*s.* per week for three months.

13,642. Do they then provide their own doctor and medicine?—Yes. There is a reason why we do not insist upon their paying to the doctor; the men here are principally connected with the Odd Fellows' Club which is a universal club throughout the country, and in that club they have a doctor provided, consequently the majority of the men belonding to our mine who join a sick club object to pay the doctor twice, and consequently we have none.

13,643. Do they receive an allowance from your club in addition to what they receive from the Odd Fellows' club?—Yes.

13,644. Is a separate account kept of your club fund?—Yes. The funds belong entirely to the miners. They are looked after by three miners, who are chosen once in six months. I act as secretary, and keep the accounts, and the balance I hand over to the Cumberland Union bank in the name of the acting committee.

13,645. The fund, as I understand you, is managed entirely by the men?—Yes.

13,646. Are the payments received from the men sufficient to provide the allowances that are made in cases of sickness?—Yes; and a balance has accumulated since we started the club.

13,647. The club, I believe, consists of about 70 men and boys?—Yes.

13,648. Do the boys make a smaller contribution than the men?—Yes, that is regulated according to the pay which they receive. A boy pays 9*d.* a month, if he get 6*s.* a week, and the one who pays 6*d.* a month gets only 4*s.* Then in case of an accident a man receives pay as long as he is ill, provided the funds are not diminished below 5*l.* If they are, then we call the members together, and provide for it.

13,649. Is that done by extra subscriptions?—Yes; by every man subscribing something extra; but that has not occurred yet. We have found that we have had plenty of money for all our purposes, so far.

Mr. James Postlethwaite, The Keswick Mines.

13,804. (*Chairman.*) Have you a sick club?—Yes.

13,805. Is that for accidents?—For accidents and sickness both.

13,806. What do the men pay?—1*s*. a month, each man

13,807. What is the allowance if a man is sick?—They receive when sick, or from accident, 7*s*. per week.

Mr. William Phillips, Greenside Mine.

13,968. (*Chairman.*) Have you a club in your mine?—Yes.

13,969. Is it a sick club or an accident club?—An accident club.

13,970. Is there no sick club?—Not that I am aware of.

13,971. What do the men contribute to the accident club?—I think they contribute 1*s*. a quarter.

13,972. Is there a separate account kept of that club?—Yes.

13,973. Do you know how that stands?—Not exactly; but I think they have a good deal of money in hand, perhaps above 250*l*.

13,974. How many men contribute to it?—Generally all the men are requested to pay to it.

13,975. Including those who are employed in the blast furnaces?—Yes; wherever they are employed.

13,976. Do the boys make a smaller contribution than the men?—Yes,—some pay 6*d*.; some pay the price of men, according to their size.

Mr. Tinniswood Millican.

14,242. (*Chairman.*) Is there any doctor who is connected with the mine; Yes, we have a doctor; the lead company find a doctor for all their workmen free.

14,243. What do the men pay a month in the shape of club money or for the doctor?—They pay nothing to the doctor, but they pay 30*s*. a year to the fund.

14,244. Is it a fund for affording relief in case of sickness or of accident?—It is for sickness or accidents either.

14,245. Is there a separate account kept of that fund?—Yes.

14,246. What is a man allowed when he is out of employment on account of sickness?—He is allowed 7*s*. a week.

14,247. Is the fund sufficient to meet all claims that are made upon it?—Yes.

14, 248. Do you happen to know what balance there is in hand?—It does not strike me at present.

14,249. Are there any Odd Fellows clubs here?—Yes, there are some at Alston, but there are none at Nenthead. Some of the lead company's miners are in some of the clubs.

14,250. Do the men subscribe to them as well as to the mine fund?—Yes.

14,251. Are they all obliged to subscribe to the mine club?—It is a condition, all who wish to become regular workmen.

Mr. Thomas Wilson Crawhall, Rodderup Fell Mine.

14,571. (*Chairman.*) I there a club?—There is no special club attached to the mine; most of the men are in some of the benefit clubs in the neighbourhood.

Mr. Josiah Rempry, The Derwent Mine.

14,891. (*Chairman.*) Have you a sick club or an accident club?—An accident club.

14,892. Not a sick club?—Not a sick club.

14,893. It is for visible hurt?—Yes.

14,894. What do the men pay towards that?—6*d*. a month per man.

14,895. Is a separate account kept of it?—No separate account is kept, the company pay the man 7*s*. per week and also pay the medical man; it is not conducted as it is in Cornwall for instance, where the men pay to the doctor.

14,896. Is there a medical man specially appointed?—Yes, and he has a salary of so much per annum.

14,897. And the men do not pay anything beyond the 6*d*.?—Nothing beyond the 6*d*.; the company provide the medical man and pay the men 7*s*. a week.

14,898. So that there is no separate account kept?—There is no separate account kept.

14,899. Do the men ever object to the doctor who is appointed?—No.

14,900. Do you consider that the 6*d*. which the men have paid has been sufficient to meet the expenses of the club?—On the whole perhaps it may be sufficient, but I think that it would be bare enough.

14,906. Is there any provision for men who are off work from sickness and not from hurt?—There are clubs in the district.

Mr. Thomas Ware, Stone Croft and Greyside Mines.

15,312. (*Chairman.*) Is there any club money paid?—No; I have tried the men, and have brought that matter before them several times, but they do not seem to see the benefit that would arise from it, and we do not like to enforce it.

Mr. George Henderson, Fallowfield Mine.

15,443. (*Chairman.*) Is there any club in your mine?—Not connected with the mine; there is one in the village.

15,444. Is there any deduction made for the club?—Not any.

Mr. John Ridley, Coalcleugh Mine.

15,503. (*Chairman.*) Is there any club?—Yes, there is a benefit society.

15,504. Is that belonging to the mine?—Mr. Beaumont contributes to it.

15,505. Is there any deduction made from the pay of the men for it?—No.

Mr. William Hewitson.

15,608. (*Chairman.*) When the men are off work from sickness, is there any club or provision for them?—There is a most excellent club at Allenheads.

Mr. Joseph Cowper Cain.

15,994. (*Mr. St. Aubyn.*) In case men are temporarily or permanently disabled from causes connected with their work, how are they provided for?—In this district they have two clubs, but they are not at all connected with the works.

15,995. They are open to agriculturists as well as to miners?—Yes, to every class. One is the Odd Fellows and the other has been of long standing

15,996. Is any contribution made by the proprietors of the mines in this district towads a sick fund for the men?—No.

15,997. Nor towards an accident fund?—No.

15,998. All the assistance which the men derive in case of accident arises from their club funds?—And from the parish.

15,999. How is that there is no club in connexion with the mines?—I believe the principal reason is that the rules were not exactly what Mr. Beaumont considered a sufficient guuarantee, or at least what he would like; that if he supported a club at all he would wish to have the rules to his liking.

16,000. Then there was a proposition to establish a club?—There was at one time, and those clubs were got up without paying attention to any proposition which was made from Mr. Beaumont or Mr. Sopwith.

16,001. From whom did the proposition to establish these clubs come?—I am not in possession of sufficient information to give all the particulars, but I should think that it would come from Mr. Sopwith. They had an old club, and Mr. Sopwith proposed to make it similar to the Allenheads Benefit Society, provided they would have it under certain rules and regulations.

16,002. And that was declined by the men?—Yes.

16,003. In fact the propristor and the men did not agree about the rules?—I fancy that that was the case.

Mr. Robert Walton Bainbridge, Teesdale and Alston Moor Mines, &c.

16,244. (*Chairman.*) Do the men belong to any sick club?—We have a sick club connected with the concern.

16,245. What do the miners contribute to it?—Every man pays 30*s*. a year.

16,246. Is a separate account kept of that fund?—Yes.

16,247. Are the contributions made by the miners sufficient to meet the demands upon the fund?—They have not been so in times past, but they are at present.

16,248. Is relief afforded only in case of visible accidents, and not for sickness?—Yes; in both cases.

16,249. What is the amount of the allowance made to each man?—7*s*. a week for sickness, and now 6*s*. a week pension after attaining 65 years of age.

16,250. Does that come out of the same fund?—Yes.

16,251. Is that pension often claimed?—Yes, we have several parties on the list.

16,252. Have you any notion how many of such pensioners there are now?—Yes, the paper which I hold in my

(K^{a}.) CLUBS.

hand will show you, from the year 1851 to 1861, the number of members, the number of pensioners, and the deaths, in those respective years.

The following paper was handed in

Governor and Company's Workmen's Fund

In the year.	No. of Members.	No. of Pensioners.	Deaths of Members.
1851	943	16	21
1852	934	15	11
1853	871	13	16
1854	940	14	19
1855	921	16	12
1856	946	16	9
1857	943	16	9
1858	965	16	14
1859	979	17	14
1860	1,020	18	17
1861	1,038	16	21

16,253. (*Mr. Kendall.*) The moment a miner becomes 65 years of age has he a right to claim a pension?—Yes, whether he be in health or in sickness.

16,254. (*Mr. Austin Bruce.*) And whether he continues to work or not?—Yes, it is totally irrespective of all considerations.

16,255. (*Chairman.*) Is there any consideration as to the numbers of years he has already worked in the mines?—None whatever. On attaining the age of 65 his personal contribution to the fund ceases, and he is entitled to that pension without any further contribution.

16,256. You say that at present the receipts from the miners are sufficient to meet all demands upon the fund?—When it was first established it was established on a too liberal basis; that is to say, the payments out were too large for the fund. In the course of a few years it became insolvent, and it was then submitted to an actuary, who reported the fund to be insolvent, and at that time the Lead Company agreed to contribute 200*l.* a year. I think that the men were called upon each to pay an additional 6*s.* per year towards the redemption of the fund, and the Company agreed to pay an amount equivalent to the whole amount of the men's contribution of 6*s.* also, over and above the 200*l.*, and that went on until the fund got into a state when it was reported to be solvent. Upon its becoming solvent, then the men's additional contribution of 6*s.* per year ceased, and the Company's contribution equivalent to that 6*s.* a year also ceased; their payment of 200*l.* a year was reduced to 100*l.* a year, and that 100*l.* a year was given because the actuary to whom the fund was then submitted, stated that the then proposed increase of the pension from 4*s.* to 5*s.* a week, and the proposed increased allowance from 6*s.* to 7*s.* per week when the men were sick, would not be met by the fund—that there would be a deficiency of 100*l.* a year. The Company at once said, in order to enable these increased allowances to be made to the members, "We will give 100*l.* a year for the next seven years, "until the fund is again reported upon." The fund has since that time undergone another septennial revision down to October 1860, and it was then submitted to Mr. Ansell, the eminent actuary of London, and he reported that the fund was not only solvent, but that there was a surplus of above 3,000*l.*, which was available either for a diminution of the contributions to the fund or for increased benefits. It was then a question whether the contributions to the fund were to be diminished, or whether an increased allowance was to be given to the sick members and pensioners, and it was decided that it was not desirable to diminish the amount of the yearly contributions into the fund, but it was more desirable to increase the benefits to the members.

16,257. By whom was that question decided?—It was decided by a general committee, in whose management it is, two-thirds of whom are selected by the men themselves, the other third is represented by the Company's several district agents in their official capacity. Then it was agreed that the sick allowance should stand as it was, 7*s.* a week, but that the pensions at the age of 65 should be increased from 5*s.* to 6*s.*, and the actuary conceived that the fund would just about meet that for the next seven years. It was also thought desirable by the committee that a payment of 2*l.* should be made towards the funeral expenses of a wife of a member. The actuary did not conceive that the state of the fund would admit of that, and the Company said, "We will continue our contribution of "100*l.* a year expressly with the view of meeting that "charge." So that now the Company are still continuing their contribution of 100*l.* a year to the fund for the current seven years, with the view of covering that payment of the funeral expenses of a wife.

16,258. Supposing the husband dies, what is done in that case?—In that case 2*l.* are allowed for his funeral expenses, and 3*l.* are paid to the widow.

16,259. Are the contributions which you have just mentioned confined to the men who work underground?—No; they apply to all the workmen in the Company's service.

16,260. Do all of them pay alike?—Yes.

16,261. They pay alike, whatever the amount of their wages may be?—Yes, and receive alike. I may mention that the number of members belonging to the Company's workmen's fund in 1850 was 921, while in 1861 it was 1,038. The number of pensioners in the year ending 1st November 1850, was 22, while in 1861 it was only 16.

16,262. Are the pensioners confined to men of 65 years years of age and upwards?—Yes, there are none under 65. It has been agitated amongst us whether the age should be reduced; but the actuary stated that he did not conceive the state of the fund would allow of it.

16,263. (*Mr. Austin Bruce.*) If a man becomes disabled before he attains the age of 65 by any accident, he is relieved, I suppose, as a sick man, and not as a pensioner?—Yes.

16,264. (*Chairman.*) If he is permanently injured, would he become a pensioner?—No; the Company are the treasurers of the fund.

16,265. (*Mr. Austin Bruce.*) Do the men contribute to any other club besides that which is connected with the works?—Yes, they do; they are at liberty to do so. We object to their becoming members of the Odd Fellows, or of those clubs that travel all over the kingdom.

16,266. Why so?—We do not like it, our men, generally speaking, are local men, and we do not like them to be connected with those clubs that extend all over the kingdom; they generally contribute to clubs in their own neighbourhood.

Mr. JOHN TATTERSALL.

18,100. (*Mr. Leveson Gower.*) Have you any medical club connected with West Burton?—Not at West Burton. The miners are in some sick societies, such as the Odd Fellows and the Foresters, and those societies, but they have no medical cl
heads; they had one
up, and whether it
know.

(L^{n}.) DOCTORS.

Mr. JOHN BARRATT, The Coniston Mines.

13,392. (*Chairman.*) What remuneration does the doctor now receive?—He is paid 140*l.* a year, and he attends the families of the miners in sickness; and he attends the men in accidents and provides medicine.

13,393. Does he attend all the families of the miners for that remuneration?—Yes.

13,394. (*Mr. Kendall.*) Does he also attend the women in their confinements?—No; the usual fee in this country is about 15*s.* for attending women in their confinements; but we say to him, we will guarantee you half a guinea. Very little of that is paid, but nevertheless we guarantee to him the payment of half a guinea in those cases, which amounts to about 20 guineas a year. We do not get half of the money back again, but we take our chance of collecting it. I should mention that the doctor's salary comes out of this club.

13,395. Does the
cases of sickness?—
out of the club.
fortunately for us th
off, and they will pay

Mr. BENJAMIN PLUMMER, Goldscope Mine, &c.

13,367. (*Chairman.*) Have you no doctor attached to your mines?—No.

Mr. JAMES POSTLETHWAITE, Keswick Mines.

13,808. (*Chairman.*) Is there a doctor attached to the mine?—We have not one at present, we have had one until lately; there was some little dissatisfaction about it, and the men now find their own doctor, they prefer that.

.) Doctors.

(L^{n}.) DOCTORS.

(L^{n}.) Doctors.

Mr. Thomas Wilson Crawhall, Rodderup Fell Mine.

14,570. (*Chairman.*) Is there a doctor attached to the mine?—No.

Mr. Thomas Ware, Stone Croft and Grey Side Mine.

15,311. (*Chairman.*) Is there a doctor atttached to the mines?—No; we have no doctor.

Mr. John Ridley, Coalcleugh Mine.

15,506. (*Chairman.*) Is there a doctor attached to the mine?—Yes; Mr. Beaumont pays a part of his salary, and a part he gets by practice otherwise amongst us.

15,507. Is he obliged to attend any man?—Yes, he is obliged to attend Mr. Beamnont's men.

15,508. For sickness?—For sickness, and everything else in fact.

15,509. Do the men pay anything towards it?—Yes, they pay 5*s.* a year for the head of the family, and if he has any sons working in the mines, they are charged 2*s.* 6*d.*

15,510. Does the doctor attend the family for that, or only the men?—He attends the family, unless a son or daughter leaves the family and goes elsewhere and falls sick, and then I believe he can charge; but as long as they remain altogether as a family, what I have stated is the regulation.

15,511. Do the men ever make any objection to the doctor?—No, we have had the doctor I dare say 20 years now, and he suits the people very well; they like him very well.

Robert Walton Bainbridge, Esq., Teesdale and Alston Moor Mines, &c.

16,242. (*Chairman.*) Is there a doctor attached to the mines?—Yes, the Company find a doctor in each of the districts.

16,243. How is he paid?—He is paid by the Company exclusively, without any charge being made upon the men.

Mr. John Knowles.

17,726. (*Sir Philip Egerton.*) Do your company take any steps for providing medical aid to your workman?—No, we do not; but if a man should happen to receive any little accident we assist him.

(*b*^{n}.)—POST MORTEM EXAMINATIONS.

(L b^{n}.) Post Mortem Examinations.

Dr. James Rumney.

14,055. (*Chairman.*) Have you ever made a post mortem examination to ascertain how the lungs were affected?—I have only had one since I have been here.

14,056. Was that a case of disease of the lungs?—Yes.

14,057. Do you think that that was brought on by working in the mines?—Yes, but not here, it was brought on at Alston.

14,058. What was the effect produced upon the lungs?—Distension of the air-cells of the lungs.

Mr. William Montgomery.

15,728. (*Chairman.*) Have you ever had an opportunity of making post mortem examinations?—Never; they are never allowed in our country.

Mr. William Ewart.

16,374. (*Chairman.*) Did you ever have a post mortem examination?—Never. Post mortem examinations in these counties are difficult to be had.

Mr. John Richard McCollah.

17,182. (*Mr. Kendall.*) Have you ever made a post mortem examination of any of the miners who have died from the miners' disease?—No.

17,183. I suppose there is an objection to it?—They will not allow it here.

M^{n}.) Dwellings.

(M^{n}.) DWELLINGS.

(M^{n}.) Dwellings.

Mr. John Richard McCollah.

17,198. (*Chairman.*) You say that there is a great improvement in the cottages; have you seen the cottages at Hurst?—Yes; there is great improvement there, more especially; during the last 15 years there has been a great improvement

17,199. In the way of drainage or what?—An improvement in the cottages.

17,200. I believe that there was fever there at one time to a great extent?—Yes; tyhus continued there for nearly ten years.

17,201. But you think that since improvements have been made there has been less fever?—I do not think that there have been any cases of typhus there during the last ten years.

Mr. Robert Daykin, Hurst Mine.

17,499. (*Chairman.*) Are the cottages in your district good?—They are pretty good of the kind, but small.

Mr. John Knowles.

17,727. (*Sir Philip Egerton.*) Do you hold the surface land or merely the minerals?—Merely the minerals.

17,728. Then the houses of the miners and the cottages of that sort are held under the surface landlord?—No; some of the houses belong to the miners themselves, and the others belong to proprietors in the neighbourhood; a good deal of the land here is let to the miners as accommodation land; the miners and those who are married more especially are fond of a little land, and have one or two cows.

17,729. Are the leases from year to year at rack rent, or for a term of years?—From year to year.

17,730. Will they build a house upon a lease from year to year merely?—No, but the house is bought; there are a great many cottages where there is no land; perhaps they have saved a little money, and they either build a house, or buy one, or perhaps it has been left to them by their fathers.

17,731. Do they buy the freehold of the land upon which they build?—It is copyhold or lease, with some old house, or something of that sort.

17,732. A miner building a house must have possession of the freehold of the land to build it upon?—Yes.

17,733. How does he get it, by purchase?—By purchase; some of the miners have land of their own as well, just a few acres.

17,734. (*Mr. Holland.*) Freehold?—No, copyhold.

Mr. Jonathan Coatsworth, Keldheads Mine.

18,063. (*Sir Philip Egerton.*) Are their cottages freehold, or are they generally leased from the landed proprietors in the neighbourhood?—At Preston and Redmire the principal part of the cottages belong to Lord Bolton, and a great many of the miners have a small portion of land, and keep a cow or two.

Mr. Henry Daykin, Grassington Mine.

18,471. (*Sir Philip Egerton.*) Have they comfortable homes?—Very comfortable, I should say, for the most part.

18,472. What sort of distance have they to come to work?—I should say that it would be three miles from this village up to some of our places.

18,473. Do they walk three miles there and back?—Yes.

(*b*^{n}.)—DISTANCE AT WHICH MINERS LIVE FROM THEIR WORK.

(M b^{n}.) Distance at which Miners live from their Work.

Mr. Tinniswood Millican.

14,260. (*Chairman.*) Do the men reside near the mines, or at a distance from them?—Generally, I think, they are near our mines. At Nenthead they are not far off, about one-sixth of a mile perhaps, and some of them three quarters.

(*c*^{n}.) LODGING HOUSES, OR MINE SHOPS.

(M c^{n}.) Lodging Houses, or Mine Shops.

Mr. Benjamin Plummer, Goldscope Mine, &c.

13,650. (*Chairman.*) Do nearly all the men reside at a distance from the mines?—Yes; there are a few, perhaps nine or ten, in the village; but generally they do.

13,651. What distance have they to come?—From Keswick, five miles, and others three miles and a half; but there is a lodging house for them.

13,652. What day of the week do they come to work?—On Monday mornings. They work till Wednesday dinner time; then they go home, and remain at home for 16

) Lodging
ses, or
e Shops.

(Mcⁿ.) Lodging Houses, or Mine Shops.

hours. They come back the next day, and work the afternoon shift, and follow on to the end of the week.

13,653. How many men are accommodated in the lodging house?—About 25, I should think; but they are never all there at the same time scarcely.

13,654. How many men can sleep there?—I think about 15 or 16.

13,655. Will you be good enough to describe the size of the lodging house and the nature of it?—It is on the second floor; below it we have store houses and lead houses. I think it is about 20 feet long by 15 or 16 feet wide. It is slated, it is plastered against the slate inside, to keep out the cold. I think that the extreme height up to the rigging will be 12 or 14 feet, but the sides of it would be five feet six or six feet only.

13,656. Do the men sleep in places like cabins, or one man over another?—No. The beds have plenty of room. They are all on the same floor on rough bedsteads.

13,657. (*Mr. Kendall.*) In short it is one large dormitory?—Yes.

13,658. (*Mr. Austin Bruce.*) Where the men sleep four nights a week?—Yes.

13,659. (*Chairman.*) Do they pay for this accommodation?—No. The men are provided with the room and firing from the mine.

13,660. (*Mr. Austin Bruce.*) Are they supplied with bed clothes?—No? they provide their own.

13,661. (*Chairman.*) Do they cook for themselves?—They generally bring their food cooked, and warm it at the lodging house. If they have potatoes, of course they dress them there. They have a boiler on the premises, and frying pans, and the necessary utensils if they choose to dress their own food.

13,662. (*Mr. Kendall.*) Is there no matron there?—No; the men do for themselves.

13,663. They take care of themselves, and make their own beds?—Yes; they have been accustomed to it from boys, and they take to it quite naturally, as their wives do at home.

13,751. (*Mr. Holland.*) You have spoken of a dormitory or long bed room, is there a chimney in it?—No.

13,752. Is there no opening for ventilation?—Yes; there is a window for ventilation in the end near the roof.

13,753. Is the air pure in the morning; have you been in it before the men are out of bed?—I have not been in it before some of the men are up, but I go in perhaps when there are five or six in bed and before the windows have been opened, and I have found the air then pretty good, if they allow the ventilation to remain open, but with 14 or 15 men there are various opinions, and those who cannot stand it will object to its being open.

13,754. Is that room better or worse ventilated than the bed rooms of labourers generally are?—I think it is as good as any labourers sleep in.

Mr. James Postlethwaite, The Keswick Mines.

13,792. (*Chairman.*) Have you a lodging house on the mine?—Yes.

13,793. Do the men sleep there?—A few sleep there, not many; we have accommodation if they choose, but they prefer going to their homes.

13,794. Do they go that distance every day?—Yes, they would rather do that than lodge away from their homes.

13,795. When they come out of this wet mine do they change their clothes?—Yes, all of them.

Mr. William Phillips, Greenside Mine.

13,920. (*Chairman.*) Have you any lodging house on the mine to accommodate the men?—We have several.

13,921. How do the men manage?—They have beds in those places, and the company provide them with coals. They come on Mondays about 12 o'clock, and leave again on Fridays at 12 o'clock, and they calculate to work five eight-hour shifts or cores during that period; they stay at the mines from the Monday till the Friday.

13,922. How many men generally sleep in each of the lodging houses?—Some of the shops would hold perhaps 40; they are large shops.

13,923. What is the size of the room where these 40 men would sleep?—Our new shop I should think is, although I never measured it, above 60 feet long; it is a very high house, and the room stands 12 or 14 feet high.

13,924. Do the men sleep one above the other?—They have iron bedsteads and some wooden, like hammocks on board a ship, one above the other.

14,001. (*Mr. Kendall.*) Is there any one or more appointed to take care of the dormitory where the men sleep, and to superintend?—The men themselves do it; there is a rule written up; there are so many chosen by the parties there and they do it in their turns; one does it one week or a fortnight, and so on.

14,002. Do they choose a superintendent among themselves, and does he make all the necessary arrangements for them as to sleeping?—Yes, and then I go through the place, and if the things are not kept properly clean, I turn round upon the parties who have bad charge of the shop, and I either fine or caution them.

Mr. Tinniswood Millican.

14,332. (*Mr. Kendall.*) Have you any sleeping places on the mines?—Very little of that; we have very few houses of that kind.

14,333. Have you any?—Yes, there are three at our place, but they are very small places.

14,334. How many men can sleep in one place?—There will be 12 men in our largest place; the Teesdale mines have more lodging houses, and good ones there. Our men live near their homes here, but in Teesdale the mines are at a greater distance from their houses.

Mr. Thomas Wilson Crawhall, Rodderup Fell Company.

14,574. (*Chairman.*) Do they avail themselves of the schools?—Yes, generally; many of our men are living at considerable distances; some live at Alston, and some up at Garrigill, which is in the opposite direction, but we have a rule that if they live more than a certain distance from the mine they must lodge either at the mine or in the neighbourhood.

14,575. Have you lodging houses at the mine?—We have some lodging houses, and there are also several houses belonging to the company which have been built larger than they would have been; they are better houses, in order to facilitate the taking in of lodgers; a good many get in in that way.

14,576. Do you charge them so much?—The lodging is free, and we find coals.

14,577. Do they find their own bedding?—Yes; if required we put up a few bedsteads.

14,578. How many should you suppose that you have generally lodging in your own houses?—I can scarcely state the number; it varies considerably.

14,579. How many do you allow in one room?—Just as many as they can get the beds put in for; they generally have two in a bed.

14,580. Do they stay there for the whole week?—They generally come on the Monday morning and leave on Friday night; sometimes rather early; they will sometimes perhaps go home, say on Wednesday night, coming back on Thursday morning, and then finally leave on the Friday night.

Mr. Josiah Remfry, The Derwent Mines.

14,868. (*Chairman.*) Are there any shops or lodging houses?—We have no lodging houses, that is to say we have no shops, because those who bring their wallet, non-resident men, lodge with other parties in the neighbourhood.

Mr. Thomas Ware, Stone Croft and Greyside Mines.

15,338. (*Chairman.*) Have you any shops for them?—Only one.

15,339. Where do the men who carry their wallets put up?—At the cottages. The people take them in at so much a week; they pay so much for four or five days; a great many of them try to get away on the fourth day. They all get away on the Friday, and sometimes they get away on the Thursday night.

15,340. Is that in violation of their bargain?—Rather. When I first came there the afternoon and night men worked but four shifts a week; but now they work five, some of them, but not at all times.

15,341. Do you not think that there is rather a want of cottages near the mines?—I do not know; I have built some cottages, or rather the company have. They built two, and we have had a great difficulty in letting them; the men prefer going elsewhere.

15,342. Have any of those men who come from a distance a piece of land and a cow?—I believe they have a piece of land and keep a cow; some of them I know have.

15,343. Probably that is the reason why they will not reside on the mine?—Yes; I think that that is partly the cause of it.

15,349. (*Mr. Davey.*) Are the cottages very much crowded where the men obtain their lodgings?—I have not examined them; but I know that some of them must be crowded from the number of people they have; our own cottages are not so not much crowded.

15,350. But are the cottages where the men are taken in as lodgers crowded?—Yes; some of them must be crowded.

15,351. Do the men have separate beds?—I think some of them sleep two in a bed, and upon occasions I have known them to sleep three in a bed.

15,352. In making shifts does one part get out of bed and the other turn into the same bed?—I cannot answer that question; I do not know; I have heard them talk of sleeping three in a bed.

16,353. (*Mr. Kendall.*) Do you know what they pay for their lodgings?—In some places 9*d.*, in others 1*s.* a week, which is the highest.

16,354. What is done for them for that 1*s.*; do they get their washing done?—Nothing at all; they have to cook their own food.

Mr. John Ridley, Coalcleugh Mine.

15,481. (*Chairman.*) Have you any shops or lodging houses?—No; nothing of that sort is required; some of them get lodgings about the place.

15,527. (*Mr. Davey.*) You say that some of your men live in lodgings in the neighbourhood of the mines; are they much crowded?—No, they are not crowded; there are perhaps two or three lodgers in a certain family where they have convenience.

16,528. They have some home occupation, have they not?—Some of them work little farms as well as work at the mines.

Mr. William Hewitson.

15,625. (*Mr. Kendall.*) When you visit those miners, of course you are able to see how their bedrooms are, and to know as to whether they are crowded or not; how is that?—In some cases they are crowded.

15,626. How many have you ever known sleeping in one room?—I cannot say.

15,627. But at times they are much too crowded?—Sometimes they are much too crowded, but that is the people's own fault; it is perhaps in order to make up a little money that induces them to take lodgers. There are some ironstone works in an adjoining district, and some of the workmen, single young men, come over to Allenheads to get lodgings, to sleep for the night.

15,628. Do you think that much evil arises from that?—It cannot be good at all; overcrowded apartments must be objectionable.

15,629. You have never met with any case of illness which followed immediately upon it?—Not which I could trace immediately to that cause.

15,630. (*Chairman.*) Those are mostly young men, are they not?—Yes.

15,631. (*Mr. Austin Bruce.*) Have you any statistical reports besides those with which you have furnished the Commissioners?—No.

15,632. (*Mr. Holland.*) Do a large proportion of the men live in overcrowded sleeping rooms?—Not many, I think; not a large proportion by any means. In fact the dwellings in our district are very comfortable; indeed some of them are almost luxurious for miners.

15,633. Than the overcrowding of which you speak is an exception?—It is.

Robert Walton Bainbridge, Esq., Teesdale and Alston Moor Mines, &c.

16,310. (*Mr. Davey.*) Have you lodging houses also?—Yes.

16,311. How many do you get in those houses generally?—That depends upon the number of men employed at the mine, and how many of these men are able to go to and from their work to their own homes.

16,312. What accommodation have you for the men who come there, have they separate beds?—There are beds which will contain two men each, two men are allowed to sleep together.

16,313. In shifting the pairs do they come into the same bed afterwards, or are there two in each bed for the whole of the time?—In general I apprehend that two men appropriate a bed and stick to that bed, they do not like sleeping indiscriminately in each other's beds.

16,314. Does it happen that two men are in the bed at the same time?—Yes.

16,316. How many beds have you in one room?—That varies very materially; the beds are six feet four inches in length, and four feet four inches in breadth, if I mistake not; we generally fill a room with beds, and we have two tiers in general, but I may say that practically the upper tier is seldom used; the lower beds are generally those which are used, the upper tier is only put into requisition when there is a greater number of men than are sufficient to occupy the lower.

16,316. What is the ventilation of the room?—We have an opening under the eaves for the admission of fresh air; we also have an opening at the ridge. This is a specimen of our ventilating apparatus (*producing the same*).

16,317. (*Mr. Holland.*) Is that the size of it?—No.

16,318. (*Mr. Davey.*) Who settles the ventilation, is it done by the men themselves?—The agents do that.

16,319. (*Mr. Holland.*) What size do you use for your ventilating apparatus?—Those that we use ourselves are perhaps a foot in diameter, one tube within another, so that there is an inlet and an outlet draft, that is the principle of it.

16,320. (*Mr. Davey.*) What distance have the men generally to come to these lodging houses?—Many of them have to travel six or eight miles to the mine where they are at work; the lodging houses are always at the level mouth. With regard to the ventilation, I may state further that we carry up a tube parallel with the chimney flue. The object of that is to carry off the impure and heated air. When the fire is on, the heat in the chimney flue extends to this tube and rarefies the air in it, so that it will either carry the vitiated air off or bring fresh air in, and whichever it does it is beneficial; that is one means of ventilation which we have; we make use of that also in our cottages here; the company have built a number of cottages for the use of the miners upon the spot, and we make an opening under the ceiling, and carry up a tube, say of three or four inches in diameter, parallel with the chimney but quite distinct from the chimney, still the air in that parallel tube is affected by the heat in the chimney, and it will create either an internal or an external draught; it will either admit pure atmospheric air down the tube, or it will carry off the vitiated air of the room into the open air at the ridge.

16,321. (*Mr. Holland.*) What gives the motion down the tube?—The natural pressure of the atmosphere; the air in the room is rarefied, and is of less weight than the cold atmosphere.

16,322. (*Mr. Davey.*) Have your men who live in the lodgings houses any holdings of fields?—Yes, a great many of them have little farms.

16,325. What proportion of your men live in lodging houses?—In Teesdale, I should say fully two-thirds, or more than that; we have a much larger proportion in Teesdale than in any of the other districts, owing to the fact that the mines are, generally speaking, at a distance from the town.

16,338. (*Mr. Austin Bruce.*) Have you any objection to state what is the rent which they pay for those houses?—3*l.* 10*s.* and 4*l.* a year.

16,339. How many rooms are there in the houses?—Four rooms; we charge 4*l.* 10*s.* a year for four rooms and a garden.

16,340. Of those rooms how many are sleeping rooms? Two of them; and then they generally make use of the kitchen also as a sleeping room.

16,341. So as to make a division of the sexes of the children?—Yes; the father and mother generally sleep in the lower room, and the girls upstairs in one room, and the boys in another.

16,342. Do many of the cottages belong to the workmen themselves?—Yes, many of them.

16,343. Is that a common way of investing their savings?—Yes.

16,344. (*Mr. Holland.*) Do they take lodgers?—Our rule with regard to the Company's houses is, that they shall not take lodgers; but I suppose that we find it needful to be blind occasionally.

16,345. Then that rule is relaxed?—Yes.

16,346. What relaxation do you allow?—I cannot say that we have any general rule. Supposing that there was a surplus of population over the house accommodation, then instead of going to the party and saying "You ought not to have lodgers," I should think it advisable to look over it.

16,347. Is there often a surplus of population over the house accommodation?—Occasionally there is, but only occasionally.

16,348. Then the overcrowding as regards lodgers is an exception, is it?—It is an exception to the general rule.

Mr. William Lee, Wire Gill Mine.

16,908. (*Mr. Davey.*) Have you any lodging houses connected with this mine?—Yes.

16,909. How many men occupy them generally?—Perhaps in the shop which you have seen there may be

(L^{n}.) DWELLINGS.

some 80 or 84 men; there is another lodging house as well.

16,910. How many of those men sleep in one room?—That is according to the size of the room; two men sleep in one bed.

16,969. (*Mr. Davey.*) We have the dimensions of the rooms now; one room contains 10 beds, how many have you ever known sleep in that room at one time?—I cannot say; if all the beds were occupied there would be two in each bed.

16,970. That would be 20 men; have you ever known it to be full?—No, I do not know what numbers sleep in that room.

16,971. What is the greatest number of beds that you have known to be empty out of that?—Perhaps they may all be full, I am not prepared to say that they are not.

16,972. I presume that you have some levels working the whole of the time, three shifts?—Only one.

16,973. In those shifts do the men after a day shift occupy the same bed?—They have another bed; of the four men two are at work and two are out, but they occupy two beds. There are only four men out of the eight there at one time, two are working at one time and two are in the shop.

16,974. What becomes of the other four?—They do not come home till these are done. On Monday morning two men come and they commence their work.

16,975. At what hour?—In the forenoon, at two o'clock or from that to a later hour, just as is convenient; those who go in the afternoon change those who went in the forenoon; these forenoon men come out and rest eight hours, and those four go on in that way till the Thursday morning when they have done their work; two fresh men come on upon the Thursday morning, and they work from six on the Thursday morning till two in the afternoon, and two other men who have not been to work take their place and work till 10 at night. Those four men get each four eight-hours shifts by 10 o'clock on Saturday night; they are eight hours at work and eight hours at rest. The first four have done at six o'clock on Thursday morning, and they go away home, and stop at home for a week till the Thursday comes again. That is what we call back end and fore end.

16,976. (*Chairman.*) Then two men never sleep in a bed one after the other?—It is not the rule to do so, but they might choose to do so; the rule is that four men have two beds.

16,977. (*Mr. Davey.*) How are the rooms ventilated?—By ventilators at the top, and at the sides as well.

16,978. Who has the management of the ventilation?—I have, under the direction of the superintendent, Mr. Bainbridge; we have shop managers as well.

16,979. Do you ever go there in a morning before the men get up or just as they get up?—I am generally here after they get up; they rise perhaps at five in the morning.

16,980. Do you ever go into their bed rooms?—Yes.

16,981. In what state is the air then?—It is pretty fair.

16,982. Do you ever find the ventilators stopped up?—They have been, perhaps, stopped up in the winter season.

16,983. But not at this season of the year?—I think not.

16,984. I saw some to-day stopped up?—That is the fault of the men.

16,985. (*Chairman.*) Does the air come down and go up or only go up?—When the air is not heated in the room it will be a down draught; the heated air will escape upwards.

(M$^{e n}$.) *Lodging Houses, or Mine Shops.*

16,986. (*Mr. St. Aubyn.*) The number of men allotted to each room would be too large for their health, would it not, if it were not for the perfect ventilation of the apartments?—Perhaps it might.

16,987. And therefore you have provided a sufficient number of holes for ventilation?—Yes, such as to make them comfortable.

16,988. But if those holes for ventilation are not used the health of the men must suffer?—Perhaps it may a little; but they generally are used.

16,989. The Commissioners to-day observed that most of the side holes for ventilation were filled up with heather and straw?—I observed one or two in that way.

16,990. Who is responsible for that?—The manager of the shop; there are two men appointed to look after all these things; they take the management of the shop, and we assist them.

Mr. Mark Pinkney, Wire Gill Mine.

16,957. (*Mr. Davey.*) What situation do you hold in this mine?—Engineer.

16,958. Have you measured the rooms at the lodging houses?—I have measured the two which you requested should be measured.

16,959. Will you give the measurement of those two rooms?—They are rather peculiarly formed. There is a slight plan of them (*producing the same*). The length of one room is 16 feet 8 inches, by 15 feet 3 inches. The height of the side wall is 8 feet, and the height to the ridge 13 feet 4 inches.

16,960. How many beds are there in that room?—There are 10 bedsteads standing there; there is provision for 10 beds. I cannot say whether the beds are all occupied.

16,961. Those beds are occupied each by two miners?—Yes, when they are occupied, that is the usual practice.

16,962. Is it the case that they sometimes occupy them by day as well as by night?—Some of them do; I cannot say which of them do; that is an exception; there is a very small number that occupy them by day.

16,963. But do they occupy the same beds as have been occupied in the night?—I cannot say; the mine agent would be the proper party to give you that information. I am not acquainted with that point.

16,964. Will yo give the measurement of the other room?—The other room is 10 feet by 13 feet 2 inches.

16,965. And what is the height?—It is what we locally term a T fall, it is 7 feet 6 inches in height on one side, and 2 feet 3 inches on the other.

16,966. How many beds have you in that room?—Three.

16,967. (*Chairman.*) You have taken the measurement?—Yes.

16,968. Is the ceiling plastered below the slate?—No, it is open to the slate in the large room, and there is a ventilator on the top as well. The small or T fall room is boarded beneath the slates.

(d^{n}). POSSESSING FREEHOLDS OR RENTING FARMS.

(M$^{d n}$.) *Possessing Freeholds, or Renting Farms.*

Mr. Tinniswood Millican.

14,302. (*Mr. Davey.*) I believe your men have small farms or small holdings, on which they work and cultivate them?—Yes; and it does them good a little working at the surface.

(N^{n}.) CHILDREN WORKING IN MINES.

(N^{n}.) *Children Working in Mines.*

Mr. William Mitchell, Coniston Mines.

13,567. (*Mr. Austin Bruce.*) At what age do the boys come into these mines to work?—We do not take any boys younger than about 14.

13,568. Are there many boys employed between the ages of 14 and 18?—We have a few but not many; perhaps half a score, or perhaps there are 12, working in the mines or in the underground department.

13,569. As a rule, are there fewer boys working in the Coniston mine than there would be in a mine of equal importance in Cornwall?—Yes.

13,570. To what do you attribute the fact that fewer boys are employed here than in Cornwall?—It is owing to the system of working; we have a single-hand system here; one man holds the jumper or the borer with one hand, and he strikes it also with the other in boring rock. In Cornwall the system is double hand work; one man strikes, and boys generally are used to turn those holes for drilling.

Mr. William Phillips, Greenside Mine.

13,977. (*Chairman.*) What is the youngest age of the boys employed in your mines?—We have none in the mines, but on the workings; perhaps nine or ten years of age the youngest.

Mr. Tinniswood Millican.

14,252 (*Chairman.*) What is the youngest age at which boys work underground?—14 I believe; we allow them to go in, but not until they are about 18 years of age, to work regularly; they wash in the summer on the surface, and we let them go underground in the winter at 14 years of age, when they cannot wash outside.

(N^{n}) CHILDREN WORKING IN MINES.

(N^{n}.) *Children Working in Mines.*

14,253. They work underground in the winter?—Yes, they just help to get away the work, they work in the different partnerships; we allow them to go along with the men, so that they take care of them; their work is to wheel to certain parts, and to separate the work, and teach them how to strike and beat.

14,254. Do the men work double or single-handed?—Double-handed generally; very few single-handed.

14,255. I suppose that a miner may take his son down, although he is younger than the age you have mentioned?—No, several do not go in till they are 20.

Mr. John Ridley, Coalcleugh Mine.

15,456. (*Chairman.*) Are there any boys among that number?—Yes.

15,457. What is the youngest age at which they go underground?—We have some boys who blow the machine occasionally, and they go in when they are about 12 or 14. Then amongst these we have 14 under 16 years of age.

Robert Walton Bainbridge, Esq., Teesdale and Alston Moor Mines, &c.

16,206. (*Chairman.*) What is the youngest age at which you allow a boy to go to work underground?—18 is the youngest age.

16,207. May not a father take his son down into the mine with him before that?—No, we do not allow that; and at present in Teesdale here particularly, many of the boys are kept out until they are 20 or 21, but that is contrary to our wish; we should conceive it desirable that a boy should go underground at 18 in order to obtain skill when his mind and body are in a proper state for learning.

16,326. (*Mr. St. Aubyn.*) You have said that during the three months of hard weather in winter the boys of 14 work underground?—Yes.

16,327. Do all the boys who are employed by you go underground, or do a part of them go underground, and the remainder remain above?—At 14 years of age we place the whole of them of good character underground, till we have occasion for their services at the ore dressing in the early spring.

16,328. Does it ever happen that part of those boys remain working underground at the expiration of the hard weather?—No.

Mr. Adam Barker, Whiterside and Summer Lodge Mines.

17,074. (*Mr. Leveson Gower.*) What is the youngest age at which boys work now in the mines?—I believe that they do not do anything in the mines in a general way till they are about 10 years old

17,075. Do they work underground at 10 years old?—Yes, some few. These cases happen where there is a strong man, and he has a strong robust sort of boy, and he gets the boy out in order to make his earnings rather more. His father takes him along with him.

17,076. There has been no change as to the age at which they go into the mines?—No; I do not know that there has been any change in that way. When I was a boy, boys had to carry their work a very long way to the bottom of a shaft with their feet in clay, with the trapping on, and a bucket behind them, and they had the skin off their shoulders and other places. The trapping was made of leather. They now go in, and they have what are called durks and iron rails; they had wooden rails at that time, and it is three times as easy work for boys at the present day as it was at that time; and the mines, in a general way, are far better ventilated than they were 30 years ago.

17,077. Have boys who begin so early now any opportunity of going to school?—The fathers could not afford to allow the boys to go to school longer than that time.

17,078. When they begin working they leave off going to school?—They do.

Mr. Thomas Coates, Arkindale and Fell End.

17,258. (*Chairman.*) At what age do the boys go down?—It just depends upon circumstances; if a goodish man has a lad, and he is badly off, and has a large family and only his own hand labour, we generally let him take him when he will; but we generally like them to be about 12.

17,259. But still you would not prevent a man if he wanted to take his boy at an earlier age from doing so?—I would not if he was a good man, and I thought that the boy was likely to work for him. It is just for the sake of earning a bit of money; he would get just half wages.

17,326. (*Chairman.*) What is the youngest age that you have known?—About 10 years; they will come when they are about nine.

17,327. How will the father take such a boy down?—He would not take him down the shaft at all.

17,328. But suppose he has to go down in a shaft or up a rise?—He will take him on the top of his back.

Mr. Francis Taylor, Old Gang Mine.

17,511. (*Chairman.*) Do you make any limit as to the age at which boys shall go underground?—We generally keep them working upon the bank till they are 11 or 12 years of age, unless it be a father who wants to take in his boy himself, and then we allow him to take him at 10 or 11.

17,512. But I suppose the father sometimes takes a boy younger?—No, we keep them employed at bank; that is a rule of our company.

17,513. You would not allow the father to take a boy down any mine under that age?—It is generally about 11 if their fathers are with them themselves. I can give a statement of near about the ages of all the boys.

Mr. Thomas Raw, Surrender Mine.

17,604. (*Chairman.*) How many boys?—We have 33 under 20 years of age.

17,605. Do you make any rule about the age at which they shall be allowed to go underground?—We do not allow them to go until they are turned 12, unless they are very strong boys; and unless a father takes his son with him, if he is a strong boy. We endeavour to put him into a convenient place, so that he is not exposed to danger; he can be taken up in the waggons near to a place where he can get assisted up on coming out.

17,606. I suppose you would say danger from climbing?—Yes, a boy of 12 or 14 or 15 is not so able to climb as one of 20, and so on; they are not so strong. We generally let them go up the levels where there is no climbing. In many places they work close to the level side where they have no ascending or descending.

17,607. But with a boy of 10 it would be dangerous to climb?—A boy of 10 is too young.

17,608. Do you make any regulation about the boys having been to school?—No; we have not interfered with their scholarship.

Mr. Jonathan Coatsworth, Keldheads Mine.

18,023. (*Sir Philip Egerton.*) How many boys have you in the workings?—I cannot say exactly, perhaps from 30 to 40.

18,024. What duties do they perform?—They dress the ore after it comes out of the mine; that is their employment.

18,025. At what age do they begin working?—From 18 to 20 they go into the mine generally.

18,026. Do you call them boys when they are 18?—They are young men then.

18,027. Have you any boys in the mine of younger age than that?—No; I am not aware that we have one under 18.

18,028. How is your ore brought up?—It is brought out by levels, but we have a lift at Keldhelds by windlass; but it comes up to the main level and passes out at the main level mouth. There is only one entrance to bring it all out.

18,029. (*Mr. Leveson Gower.*) Do not the miners take their young sons down into the mines to help them?—No, not until they are 18, as a general rule. They are employed in dressing at the surface previously to that. We consider that they are better out.

(O^{n}.) WOMEN WORKING AT THE SURFACE.

(O^{n}.) *Women Working at the Surface.*

Mr. Tinniswood Millican.

14,257. (*Chairman.*) Do any females work there?—No, we have not one; formerly we had some, but the company discontinued to employ them 40 years ago.

Mr. Thomas Raw, Surrender Mine.

17,609. (*Chairman.*) Are there any women employed on the surface?—Yes, in dressing the ores.

17,610. Is that a general practice here now?—It is.

(O^{a}.) WOMEN WORKING AT THE SURFACE.

Women at the

(O^{b}.) Working under Cover.

17,611. As much as it used to be?—Perhaps not to the extent that it was formerly, some 50 years ago, or something like that, I think.

17,612. Do they work under cover?—Yes, they have sheds generally.

17,613. Is there any objection to their having sheds?—No, I do not know that there is; they shade off a little light, so that they cannot see their work quite so well, but they are so open that they manage to do it tolerably well.

17,614. I suppose you could make the sheds so that it would be light?—They could be made a little more elevated in some cases, which would allow a little more light to get in.

Working Cover.

(*b*^{n}.) WORKING UNDER COVER.

Mr. Tinniswood Millican.

14,259. (*Chairman.*) Do they work under cover?—Yes, in some places, not in all; we have some of the washing places covered.

Mr. Thomas Coates, Arkindale and Fell End Mines.

17,254. (*Chairman.*) Are there any women employed at the surface?—Yes; at the washings, chiefly women; the men's labour is too dear; but nothing like so many women are employed as there used to be; some will not go to the washings at all, they will rather go to service.

17,255. Do they work under cover when they are at the washings?—Some do and some do not. We have some places covered in, but when they are covered in, generally speaking, in winter time, it is too soon dark, and too long in getting light in the mornings under sheds; it cuts an hour off either end.

17,256. Therefore it is not profitable to work under sheds on account of the light?—No.

17,257. They have never tried putting glass on the roof?—No.

Mr. Jonathan Coatsworth, Keldheads Mine.

18,034. (*Sir Philip Egerton.*) Is that done in sheds, or in the open air?—At Keldheads a part of them are under sheds, and a part of them are exposed to the weather.

(P^{a}.) EDUCATION.

Educa-

(P^{a}.) Education.

Mr. John Ridley, Coalclough Mine.

15,565. (*Mr. Austin Bruce.*) Do all the children go to school?—Yes.

15,566. By whom are the schools maintained?—By Mr. Beaumont.

15,567. Entirely at his own expense?—Yes; he built the schools and he is at the expense of supplying us with teachers, and he pays their salaries.

15,568. Do the men contribute nothing towards the schooling of their children?—All the children who attend pay 6*d.* per month.

Mr. John Walton, Allenheads Mines.

16,103. (*Mr. Kendall.*) The miners pay, I understand, 6*d.* a month for their children?—Yes, for those who attend school; they also pay for their books, &c., required.

16,104. Whatever age the children are?—Yes.

16,105. Until how old do they generally stay at the school?—11 or 12.

16,106. How early do you employ them here?—Above 11 years of age.

16,107. Not under?—Not under 11.

16,108. Do you find that the miners are anxious for their children to go to the school, or not?—Most of them are anxious, up to that time.

16,109. The moment they can earn anything, then they become anxious to employ them?—If they have large families they like to have them employed.

16,110. To help towards their maintenance?—Yes.

16,111. The children are examined and you have prizes, and so on, I suppose?—Yes

16,112. Do the miners or their families attend the examinations?—Not many of them.

16,113. Are they invited to do so?—They are invited.

16,114. Is it open to them to attend if they like?—Yes.

16,115. Some of them do attend the examination?—Not often.

16,116. Who attend, generally, when the prizes are distributed?—Mr. Sopwith attends.

16,117. Who conducts the examination?—The schools are examined by the Government inspector annually and by Mr. Sopwith, and a committee appointed for that purpose.

16,118. The prizes are awarded more by ticket than by examination?—By both.

16,119. Do the miners enforce their children going to school pretty regularly?—Yes; they go very regularly.

16,120. (*Mr. Austin Bruce.*) Are there Sunday schools here?—There are several Sunday schools, but not in connexion with Beaumont's schools.

16,121. They are maintained by the different denominations?—Yes; Wesleyans and Primitive Methodists.

16,122. Do all the children go there?—A very great number of them.

Robert Walton Bainbridge, Esq., Teesdale and Alston Moor Mines, &c.

16,210. (*Chairman.*) Will you be kind enough to state what education is provided for the children of the miners?—Our rule is that every child belonging to our workmen shall go to school between six and 12 years of age.

16,211. Do all the men contribute to the maintenance of the school by weekly or monthly payments, or those only whose children attend the school?—Each parent pays for his own children and for no others. The rule is that the girls shall go to school until they are 14, provided they remain under the parental roof; if the parent sends his child out to service, we do not stand in the way of that. At 12 years of age the boys are eligible to come to our ore-dressing floors; but in order to do that they must have a good school character. Then, from the age of 12 to 18, as a rule, they must attend the ore-dressing floors, and at 18 years of age they are allowed to be placed underground. At 14 years of age we allow them to go underground during the three winter months when the ore is not in operation. Owing to the severity of our climate here, we cannot dress the ore throughout the whole of the winter, and we must take it that on the average, for two or three months in the winter, each boy, after becoming 14 years of age, is underground; he is placed with one of the mining partnerships as a labourer, and in that way he is serving a sort of apprenticeship, or obtaining knowledge that is likely to be useful to him in after-life. At 18 years of age we consider these young men eligible to be placed as partners in the mines, and to become members of a partnership. We do not allow them full wages, but we put them in at so much in the shilling, varying from 9*d.* to 11*d.*, and in that way the experienced men, with whom they are working, are getting some compensation for their tuition; but in practice I may say that the bulk of our boys have been kept out until they become 20. In recent years, owing to the fact that we have had a greater amount of ore to dress than we had boys under 18 to dress it, they were kept out longer, so that the bulk of our boys now may be said to be kept out of permanent underground working until they are 20 years of age, and even beyond that.

16,212. How are the schools supported?—They are supported exclusively by the Company, that is, their own two schools; but every workman pays 1*s.* a quarter for each of his children that he may have taught there—4*s.* a year.

16,213. But, as I understand you, single men and those who have no children do not pay anything?—No, except they have brothers and sisters, and there is not a father.

16,214. You say that the children are compelled to attend school; what kind of pressure is brought to bear upon a parent?—I should remonstrate with a parent against the impropriety of not sending his children to school, and giving them education; and if I found any children absent, and he did not pay attention to my remonstrance, I should inflict a pecuniary fine upon him. If he still remained obstinate I should not hesitate to dismiss him from the service as an unworthy operative.

16,215. Have you ever had occasion to take such a step as that?—No, I have had occasion to fine occasionally, but not to any large amount; say 2*s.* 6*d.*

16,216. Was any objection made to the infliction of that fine?—No; I may add also, that the boys are not placed underground unless they have a good school character.

16,217. On what is that good school character based?—Every boy must pass a scriptural examination, and, upon his passing a satisfactory Bible examination, he is presented with a Bible by the Company, and he is then considered eligible for the works.

(P^{n}.) *Education.*

(P^{n}.) EDUCATION.

16,218. On what principles is the school conducted, in conformity with those of the Church of England, or of dissenters?—On neither, it is conducted on a general and liberal principle. Our rule is this, we have the Bible, and we have such catechisms in the school as contain all the fundamental doctrines of Christianity, without any denominational or sectarian bias; we use the catechism of Gall, of Edinburgh, and Lloyd's Bible catechism, and Watts' catechism, and the yearly issue of Bible lessons by the Sunday School Union's; those are the chief.

16,219. Has there never been any objection made by the miners to send their children to school on account of religious bias?—None whatever.

16,220 Do you find that the men working in the mines are to a certain degree well educated?—Yes, I consider that they are.

16,221. Do you conceive that that has had a good effect upon the general conduct of the men?—I am of opinion that it has decidedly had that effect.

16,307. Have you a night school for boys between 12 and 18?—No; several of them do attend a night school, but that we do not recognize, excepting that whenever they do attend a night school we are ready to pay. With regard to education, I may state this: the Company have a school of their own at Middleton, applicable to the Teesdale district, and a school at Nenthead, also applicable to that locality, but the men are scattered, many of them are at too great a distance to be able to send their children to those schools, and in those cases we contribute 3*s*. per quarter for each child at any school to which the parent may choose to send his child; and in some instances contribute also a yearly sum in aid of the stipend.

16,308. Any school not connected with you?—Not directly connected with us; in that case we still charge the man 1*s*. per quarter, so that the Company virtually contribute 2*s*. and the man 1*s*. I had better give you our school regulations (*delivering the same*).

Mr John Knowles.

17,736. (*Sir Philip Egerton.*) With reference to education, do any of the companies take steps for providing schools for the young persons?—We subscribe to the schools; we are very well up in the neighbourhood for schools.

17,737. (*Mr Holland.*) Are they National Schools which you subscribe to?—Yes; under Government inspection.

17,738. (*Sir Philip Egerton.*) But you find great difficulty in keeping the boys in school longer than ten years old I suppose?—Yes.

17,739. How long will they sometimes remain in school?—They will remain longer, perhaps till 13 or 14.

17,740. (*Mr. Leveson Gower.*) Do the parents contribute to the school?—They do.

17,741. What amount?—2*d* a week, perhaps.

17,742. The miners are generally a saving class, are they not?—Yes; a large number of them have money in the savings bank, and they are a saving class.

(P^{n}.) *Education.*

Mr. Johnathan Coatsworth, Keldheads Mines.

18,030. (*Sir Philip Egerton.*) Are there any opportunities of schooling?—Yes.

18,031. What schools are there?—Very good schools at three places.

18,032. To what age do the boys remain at school?—There is a great deal of difference respecting that. When they get to 12 or from that to 14 they generally leave.

18,033. How do they get their livelihood between that age and 18 when you put them into the mines?—

Mr. Matthew Newbould, Sunside Mines, &c.

18,171. (*Mr. Leveson Gower.*) At what age do the boys begin working on the surface?—On the surface they begin at 12 or 14 years of age.

(a^{n}.)—INTELLIGENCE OF MINERS.

(Pa^{n}.) *Intelligence of Miners*

Mr. Benjamin Plummer, Goldscope Mine, &c.

13,731. (*Mr. Austin Bruce.*) Do the children of the miners all go to school?—I do not know, they live so far away from the mines.

13,732. Do you find that the men are able to read and write in general?—I should think that about one half of them can write; I have had some experience of that in trying to get them to sign their names; about one half of them sign with a cross.

13,733. What should you say as to their being able to read?—Many of them can read, particularly the younger ones, for they are better scholars than their fathers.

13,734. Do you find that they do read in the evenings?—Yes; a great many of them read.

13,735. Do some of them read out to the others?—I really don't know, but I think not; I am sure however of this that they cannot read with any pleasure, the boys are fonder of play, consequently they would drown the reading of the others, and after the work of the day the boys have no taste for reading.

(b^{n}.)—EVENING SCHOOLS.

(Pb^{n}.) *Even Schools.*

Mr. William Phillips, Greenside Mine.

13,979. (*Chairman.*) Is there any provision made for the education of the children?—Yes; we have a labourers' school at the mine.

13,980. Do the men pay for it?—No; the company generally provides them with books.

13,981. Who supports the school?—Mr. Marshall and Mr. Howard, lords of the manor, sometimes give a trifle; there is no schoolmaster fixed; the miners do it themselves.

13,982. Do you mean an evening school?—Yes, or during the day when it is wet.

(Q^{n}.) *Time Men Work.*

(Q^{n}.) TIME MEN WORK.

(Q^{n}.) *Time Men Work*

Mr. William Phillips, Greenside Mines.

13,915. (*Chairman.*) The work being let for three months at a time, may the men go to their work just as they like and at what hours they like?—Yes; and work longer if they think proper; they are not compelled to time, but expected to work eight hours per day.

Mr. Adam Barker, Whiterside and Summer Lodge Mines.

17,100. (*Mr. Kendall.*) What is the average number of hours that they work a day?—I cannot speak to that in all mines.

17,101. Take your own mine; how many hours in a day do your men work?—They work here from six to seven hours, in a general way, I believe.

17,102. Underground do your men average six hours?—I am quite certain that they do.

17,103. In your younger days did they average more?—No; in my time they did not work more than about three or four hours; if they stayed six or seven hours it was considered two days work or shifts in a general way when I was young.

17,104. Was that because the men did not like to work so much as they do now, or because the air was bad?—It was the custom.

17,105. It was not because the air was bad?—No, I do not know that it was.

Sir George William Denys, Bart.

17,366. (*Chairman.*) How many hours do they work generally?—Six.

17,382. (*Mr. Kendall.*) Supposing that a man gets an ore bargain which turns out after a while to be very profitable to him, do you allow him if he likes it, or the pair, to work extra hours or not?—Yes, they may work as long as they please.

17,383. Suppose that that ore bargain is in a part of the mine where, notwithstanding all your appliances, the air is still defective, you have no power to say to those under, "You shall not work there?"—No. If a man has a bargain for 500 hings, of course, he may work all day and all night too if he likes; but they do not do so, because they are frequently in partnerships of eight men, and there are very few places where more than two men can work at a time, so that two men go in for the six hours and two men for the following six, and so on.

17,384. You do not require the men to work more than a certain number of hours where the air is bad?—No.

17,385. Still, if they choose, in consequence of some discovery, to work 12 hours each instead of 6 hours, you have no power to prevent it, though the air may be bad?—We have not.

(Q^{n}.) TIME MEN WORK.

Mr. Thomas Raw, Surrender Mine.

16,686. (*Sir P. Egerton.*) What number of hours do the men generally work in your mine?—Six hours we look for the men working.

Mr. Matthew Newbould, Snnside Mines, &c.

18,151. (*Chairman.*) How many hours do the men work?—We require them to work six; they will perhaps work from five to six.

18,207. (*Mr. Holland.*) Then from 6 till 6 the mine is occupied?—Yes.

(Q^{n}.) *Time Men Work.*

18,208. And again from 6 to 6 it is unoccupied?—Yes, in some parts, not in all parts of the mine. We have eight or nine miles of horse level.

18,209. Is the air much fresher at 6 in the morning than it is at 6 at night?—In the whole mine we have not above three workings which are rather dull.

18,210. The difference is not very great?—We have plenty of ventilation in our mines.

EPITOME OF EVIDENCE.

NORTH OF ENGLAND.—IRONSTONE MINES.

(A^{1}.) *Health and Diseases of Miners.*

(A^{1}.) HEALTH AND DISEASES OF MINERS.

Mr. Robert Kendall, Lindale Moor Mine.

12,319 (*Mr. Austin Bruce.*) Do you think that a man is able to work as many years at this underground work as he is at agricultural work?—Yes, I believe that he is. I believe that, as far as his health is concerned, he is quite as able; we have had men who have worked till they have been over 70, and have worked in mines the principal part of their lives.

Henry William Schneider, Esq.

12,388. (*Chairman.*) Are the men generally healthy?—Extremely so I consider the underground men whom we have in our employ are by far the finest class in the country.

12,389. Do you think that they are stronger and finer men than the agricultural class?—Decidedly so, infinitely superior to them as a rule; I speak of the underground men. I attribute that partly to the fact of their being the finest class of men physically, but also to their earning higher wages than any other class in the country, and therefore being able to live better than any other class in the country.

Mr. Stephen Jackson, Lindale, Cote, and Ure Mines.

12,600 (*Mr. Austin Bruce*) Do you consider them a healthy race of men?—Yes, they are very healthy.

12,601. As healthy as the agricultural labourers about?—I think so.

12,608. Do you know of any complaint to which miners are subject, and other people not subject?—No, I never knew any complaint whatever. I think they are as healthy as any other class of men that we have in this country.

12,629 Do you know any part of the country where the health of the men is not good?—Among the iron miners I do not know of any; I think that the iron miners are as healthy a class of men as any in the country.

Edward Wadham, Esq.

12,704. (*Mr. Austin Bruce.*) What is your opinion of the relative healthiness of the mining and the agricultural population?—I should almost think that the miners had the advantage.

Mr. Allan Backhouse Salmon, Junior.

12,764. (*Mr. Austin Bruce.*) Is your mining population a healthy one?—Very indeed.

Joseph Rawlinson, Esq.

12,803. (*Mr. Austin Bruce.*) Do they suffer from any complaints from which the agricultural labourers are free?—No; the miners employed here are a very healthy race of men.

Mr. John Lindow, Wood End and Gutterby Mines.

12,877. (*Chairman.*) Are the miners very healthy?—Yes, very much so.

12,878. Do they suffer from any particular disease?—None; there is nothing but pure air

12,961. (*Mr. Kendall.*) Which in your opinion is the most healthy class, the agricultural labourers or the miners?—I think that the miners are equally as healthy, if not more so

12,962. Which of the two classes do you think lives the best?—I can only tell you how our farm servants live and and how the miners live; they live as they think proper.

Mr. James Dees, C E., Parkside Mines.

13,075. (*Chairman.*) Are the men in your mines perfectly healthy?—Yes, very healthy indeed,

Mr. John Bateman Wilson.

13,238. (*Mr. Austin Bruce.*) You have stated that on the whole miners are more subject to rheumatism than the rest of the population?—I do not know that there is much difference per cent. if you apply the statistics in that way; it is what nearly all the labouring classes are subject to, but I think that perhaps, if anything, the iron ore miners have a greater proportion per cent.

Mr. George Dixon, Winder and Yeathouse Iron Mine.

13,289. (*Mr. Austin Bruce.*) Do you observe any difference between the health of miners and of colliers?—None whatever.

13,322. (*Chairman.*) Are the men healthy?—Generally speaking

Joseph Whitwell Pease, Esq.

16,517. (*Chairman.*) Should you say that these miners are a healthy class of men?—I cannot answer the question from not having given particular observation to that, but I hear no complaints from the doctor. My own view, in looking at the men, would be, that they were healthy, but there has been no time to test the longevity of the miners working in the mines I have referred to; they were opened out in 1853, and it is therefore only nine years since they have been in operation.

16,518. Do you have any men on the sick list at any one time?—Not that I am aware of.

16,519. Do the men ever complain of shortness of breath?—I have never heard any complaints of that kind.

16,577. (*Mr. Austin Bruce*) In the favourable circumstances under which your workmen are employed underground, do you consider that their health is at all worse than that of the men who are employed on the surface?—I am not able to answer the question from any data, my own judgment would be that they must necessarily suffer from working in less pure air. I cannot say that I have any reason for saying so, beyond the general impression that I think we should all entertain that that must be the case.

16,578. Do you observe any difference in the appearance of the men?—No; I think on a Sunday, when they are washed, they look as well as the outside men.

16,579. Do they not look more pale?—I should say that they were looking more pale when they come out of the mines in the afternoon, but that is after doing their day's work. I very seldom see them when they are going in.

16,580 What is about the age of the older workmen who are engaged underground?—There are old men at the furnaces, men who are working at 15*s.* or 16*s.* a week, who are, I should think, from 60 to 70 years of age.

16,581. They are doing the light work?—Yes; there are miners from 55 down to the age I have named, 19.

16,582. If they do not continue to be miners above 55, is that because the work is too hard, or because their health and strength have failed them?—From the district being newly settled, it hardly affords me sufficient statistical information to enable me to answer the question; it would be merely opinion or a guess.

16,583. I think you have stated that there are no cases of men suffering from asthmatic complaints?—I never heard of any; I never, in going through the mines, met with a man who complained of asthma.

16,601. (*Mr. Holland*) Do your miners look as healthy as the colliers do?—I think more so.

16,602. Have you ever heard them complain of their appetites being injured by their work?—Never.

16,603. Which of the two earns the most, the colliers or the miners?—I think there is very little difference; I have known the colliers to earn as much as our highest men. The working prices that I have given have been averaged over all the earnings; I have known men earn in these

(A^{1}.) HEALTH AND DISEASES OF MINERS.

mines 6s. 6d. a day, and I have known colliers do the same.

Mr. John Marley, Eston Mine.

16,717. (*Mr. Austin Bruce.*) Have you observed among the miners any of that difficulty of breathing which is so common among the lead miners of this district at a certain age?—Never.

16,718. (*Mr. Holland.*) Are the ironstone miners quite as healthy as the colliers?—Quite so.

Mr. Addison L. Steavenson, Normanby and Skelton Mines.

16,768. (*Mr. Austin Bruce.*) Do you observe any difference between the physical appearance of these men and of the colliers that you have been accustomed to?—They are bigger and stronger men in this district and more of the character of the navvy. The colliers generally have a whitish pale appearance, and these men not so much so.

16,769. Then you consider these men to be a healthy class?—I do, very.

(Ab^{1}.) Age and Appearance of Miners.

(b^{1}.)—AGE AND APPEARANCE OF MINERS.

Thomas Roper, Esq., Lindale Moor Mine.

12,209. (*Mr. Austin Bruce.*) Do you observe any difference between the physical appearance of the men employed underground and of the agricultural labourers?—No, I fancy that we have the better of it.

Mr. Richard Hosking, Parks Mine, &c.

12,540 (*Mr. Holland.*) Are there more old men amongst them?—Yes.

12,541. Are you sure of that?—Yes.

12,542. Are there a good many men of 50, 60, or 70 years of age?—Yes; we do not call a man old here unless he is after 60 years of age; in Cornwall there are hundreds of them old men; at 45 their constitutions are breaking up.

(Ac^{1}.) Food of the Miners.

(c^{1}.)—FOOD OF THE MINERS.

Mr. Richard Hosking, Parks Mine, &c.

12,533. (*Mr. Holland.*) Do the men live better here than there?—I think they do.

(B^{1}.) MODE OF ACCESS AND EGRESS.

(B^{1}.) Mode of Access and Egress.

Henry William Schneider, Esq.

12,379. (*Chairman.*) Therefore safety cages are not required?—There are no safety cages, they are not required, and we are rather of opinion that greater care is exercised by the men under such circumstances in not using the safety cages, that when they have them they are too apt to rely upon them; we have tried them in one instance, and it did not answer satisfactorily. If the men used them, we should most decidedly adopt safety cages, because we think that it would not be right to allow the men to be exposed to any casualty which could possibly be avoided. The safety cages which we should adopt in the event of the men riding on the cages would be disengaging cages, which in the event of the rope breaking would remain suspended in the shaft, and so prevent their falling to the bottom. Also cages which would disengage on reaching a certain point to prevent their being drawn over the pulley, and immediately on the cage being disengaged the clutches would take effect, and the cage would remain suspended.

Mr. John Lindow.

12,855. (*Chairman.*) How do the men go down into the the pits, and how do they ascend?—The men go down by an engine in the cages.

12,856. Do they all go down in the cages?—Yes.

Mr. James Dees, C.E., Parkside Mines.

13,049. (*Chairman.*) How do the man go down into the mine?—They descend by a cage; we have a cage fitting into slides or wooden uprights, and the cage slides down without any lateral motion whatever.

13,050. Do you employ a safety cage?—Yes; we have safety cages in one or two of our mines, and we are applying them to all the rest.

13,051. Do you consider that they are attended with advantage?—Yes, very great advantages; indeed we have had instances of the great utility of them, for example, from the chain breaking, and the cage seizing hold of the slides, it did not go down more than half an inch with a loaded bogie.

13,052. Do you use a wire rope or a chain?—We use a wire rope in two of our mines, and a hempen rope in the others; it is a flat wire rope.

13,053. Do the men not object to going down in the cages?—No.

13,054. Do you consider the safety cage a very safe mode of carrying?—Yes, I do; there have been accidents with them, but they have occurred when the cages have been neglected. I never heard of any accident occurring when the cage has been kept in good order.

Thomas Ainsworth, Esq., Cleator Iron Ore Mines.

13,152. (*Chairman.*) How do the men go down?—We have safety cages attached to the pits.

13,153. Have you had any accident with the safety cages?—The only accident that we ever had was through the indiscretion of the under steward and the person who had charge of the cages at the top. The instructions are, presuming that this is the ground level, and that this is the pit head level, that no man is allowed to get on at the top of the pit; he always should be made to get on at the ground level. The underground steward and the man who had charge of the cage were going down the pit, and they drew up the cage to the pit top, and both got in there. Instructions were then given to the engine man to start the engine, and in doing so, he reversed his engine, drew the cage against the top, it was detached from the rope, and the guides which should have acted did not act, it being frosty weather; the slides were frozen, and the two poor creatures went down to the bottom and were killed. If they had obeyed the instructions which were issued, that they should only get on at the ground level, the accident would not have happened.

13,154. Then in frosty weather when the guides were above the ground, the safety catch did not answer?—It did not answer there, and also down the pit, because the draught of air up the pit and down the pit was pretty strong, and the slides themselves were frozen. It was the water from the pumps in this case which had frozen.

Mr. Addison L. Steavenson, Normanby and Skelton Mines.

16,736. (*Chairman.*) By cage?—Yes.

16,737. A safety cage?—No.

16,738. Was the cage wound by wire rope?—Yes.

16,739. A flat or a round rope?—A round rope.

16,740. What was the depth which they had to go down?—20 fathoms.

(Ba^{1}.) Ladders.

(a^{1})—LADDERS.

Thomas Roper, Esq.

12,381. (*Chairman.*) Are they fenced off?—Yes, from the pumps and from the drawing part.

12,382. Are there sollers at the bottom of every ladder?—Yes.

12,383. So that a man falling from one would only fall to the next?—He would only fall about 12 feet.

12,384. Are the ladders with wooden or iron spokes?—Some have wooden and some have iron. In the winter near the surface we consider the iron staves very objectionable on account of the ice affecting them. We once very nearly had a serious accident on that account; they are slippery.

Mr. Richard Hosking, Parks Mine, &c.

12,504. (*Mr. Kendall.*) Was that in consequence of the fatigue, or in consequence of the air?—I did not like the climbing of the ladders, that was the thing that I most looked at.

Mr. John Lindow, Wood End and Gutterby Mine.

12,857. (*Chairman.*) Are there no ladder-ways?—At one time we had ladder-ways, but we found that plan very dangerous; we had more accidents occur by the ladders going down to a great depth, and a great many of the men dared not go down on account of fear and nervousness.

12,859. (*Mr. Austin Bruce.*) Did such an accident as that ever happen?—No; we prevented that by putting up a staging.

(B^1.) *Mode of Access and Egress.*

12,860. (*Chairman.*) Between each length of ladders there should be, and you had, a staging?—Yes. We had a staging at the foot of each ladder.

(Bd^1.) *Wire Rope.*

(d^1)—WIRE ROPE.

JOSEPH WHITWELL PEASE, Esq.

16,535. (*Chairman.*) Do you ever use stone for arching your principal levels?—We have used bricks where there has been any fear of the roof not standing permanently in the main drifts under the bed of ore, so as to keep the roof perfectly good over the main ways and the horse ways. This mine is entirely worked to the dip, and the ore is raised to the surface by means of standing engines.

16,536. It is drawn up by wire ropes?—Yes, by steel wire ropes.

16,537. Do they run upon pulleys?—They run upon rollers or sheaves.

16,538. Have you had any experience as to the wear and tear of iron rope?—The wear and tear in these mines has been exceedingly favourable. I think that one iron rope on the outside incline drew upwards of 1,500,000 tons before it was removed; it is a round rope, 3 inches in circumference, and the load is 27 tons; it draws 27 tons on a self-acting incline, at a gradient of 1 in 11.

16,539. What kind of rope is that which draws the waggons out?—A steel wire rope. We never had more than one yet, and that has lasted 14 months.

16,540. How does the wear and tear of the wire rope show itself?—By the single wires breaking; they are inspected every day. If the wires are found to be breaking they are removed: but all the wire-rope makers will furnish a spare rope, free of cost, in order to get a fresh order, so that we have always a spare rope on the place.

16,541. Do you repair the wire rope on the spot?—Yes, with a "long thimble," as it is called; we repair it by laying in a splice of about 15 yards, so that you can work the two ends into the new piece that is placed, in the middle. There are six wires or six turns in the rope, six strands, and six wires in each strand.

16,542. Suppose you saw one of those wires or one of the strands giving way, would that be sufficient notice to you to repair it?—No, only to fasten the strand into it.

16,543. When do you consider a rope to be dangerous?—When we see four or five of the wires in a strand broken, then it is at the point of danger. With regard to the wire ropes, I may mention that we are drawing up something like 24,000 tons of coals a week, and we have not a place but that has one of the wire ropes, both underground and above.

16,544. That is in the coal mines?—Yes.

16,545. Where they are drawn perpendicularly?—Yes, or along inclines underground.

16,546. Have any accidents occurred from the breaking of the ropes?—We have had an accident from the tubs running away on one of the inclines below, but not more than one or two fatal accidents; not from the breaking of the rope; it was from the tubs, as the balance weight not being properly fastened on; they were not on at all.

16,547. Have any accidents arisen during the conveyance of the men down these pits by the breaking of the rope?—I am not aware of any. I do not recollect any.

16,548. Over how long does your recollection extend?—We have worked with wire ropes more or less for the last 14 or 15 years.

16,549. Do you ever use any hempen ropes?—Yes, constantly.

16,550. Can you speak as to the comparative safety and the comparative expense?—Yes; I can say that wire ropes are much more economical and quite as safe. I do not hesitate to say that.

16,551. Are they not safer?—I should say so; but, without looking at the statistics, I should not like to give a decided answer to that.

16,552. (*Mr. Holland.*) Can you say that the wire rope is quite as safe as the other?—I have no hesitation in saying so; I go down with them constantly.

MR. JOHN MARLEY, Eston Mines.

16,667. (*Mr. Holland.*) Is the stone drawn from the mine and put into the waggons by the use of a steam engine?—By stationary hauling engines, and by self-acting inclined planes down to the putting it into waggons, and by horses to the various stations.

16,668. For this purpose do you use a wire rope?—Yes, entirely.

16,669. Is the wire rope used along any incline going into the mine or drawing up, that is to say, any ascending or descending incline?—Yes; about two inches to the yard ascending, and up to six inches descending.

16,670. How long have you used a wire rope in these mines?—From the very commencement; the wire ropes were first used in 1851; 11 years.

16,671. Have you found them fully efficient?—The most satisfactory of any kind.

16,672. Should you consider the wire rope in regard to safety as safe as the broad hempen rope and the chain?—In connexion with the inclines much more so. There is only one vertical lift at Eston at which we use wire ropes, all the rest being nearly horizontal, the greates dip being two inches to the yard, and we prefer wire ropes.

16,673. (*Mr. St. Aubyn.*) What is the depth?—It is in course of sinking; it will be 90 fathoms; it is now 52.

16,674. What is the size of the rope?—Three and a half inches in circumference.

16,675. What is the weight of the material raised?—Not more than 6 or 7 cwt.

16,676. Including the cage?—Yes; it is sinking where there are men below the rope. If you ask me as to the experience of raising weights with wire ropes elsewhere, I can give that independently. It is a much thicker rope than at present needed, but that is the rope which we should use for raising much heavier weights if we required it.

16,677. (*Chairman.*) How do you judge when the wire rope becomes worn so much as to be unsafe?—The mechanical engineer on the works, whose duties are to examine the ropes every day, will soon seen if any single wire is broken; and if so, it is time to examine the rope carefully. Of course there is the usual length of duration, and there are the number of tons which those ropes have raised, and a conclusion can be formed as to whether the rope has been worn sufficiently long to be within the margin of safety. There are exceptions not only with wire ropes but with hempen ropes; where a rope will show no change and will break. I have heard of a new 9-inch hempen crab rope which had not been on above six days breaking.

16,678. Would the wire rope be liable to clink?—Not more than other ropes. Under the head of "Enginewright," a rule is "Once a day to examine with the bankeman the "shaft and ropes, shackles, bolts, and engines, main and "cage chain, and to see that the rapper and wires are in "good repair."

16,679. Do the men who are sinking that shaft go down?—Yes; they have to go down occasionally in connexion with the shaft from the surface, but they have access to the shaft by a drift of about 50 fathoms from the surface.

16,680. From your own experience can you state anything to the Commission with regard to the use of the wire rope in vertical shafts?—My experience upon that subject is that wire ropes are safer than hempen ropes; but with this difference, that when we have got to a depth of from 100 to 150, or say 130 fathoms, we have departed from the round wire rope and have adopted the flat wire rope instead of it.

16,681. (*Mr. St. Aubyn.*) For the whole depth?—Yes; we never have a flat rope in connexion with a round one.

16,682. (*Chairman.*) Then for a greater depth than say 130 fathoms you would recommend the flat wire rope in preference to the round wire rope and to the flat hempen one?—I would.

16,683. Would you recommend that not only as regards the safety but also as to the more economical working?—As to both.

16,684. And with that description of rope you would consider the ascending and descending quite safe?—Perfectly so.

16,685. Can the wear of a wire rope be as well seen as in a hempen rope?—Quite as well, in my opinion

16,686. (*Mr. Kendall.*) Is a flaw in the wire more easily detected on a flat rope or a round rope?—I should think that there would not be much difference, because a flat rope is composed of a series of round rope to a certain extent; they are made of different strands.

16,687. (*Chairman.*) Will you state to the Commission your reason for recommending a flat rope for a greater depth?—As you increase in depth you require the engine end of your rope to be thicker and stronger, having a greater length of rope to support. The manufacturers can increase that strength, and taper the rope much better in a flat rope. It is entirely a mechanical difference, and there is the winding on the engine-drum as well.

16,688. A flat rope would not occupy so much space on the drum?—No, but that is not exactly the reason. You can coil any number of turns with a flat rope, but with a round rope it has to coil backwards and forwards, so that in going over the pulley it is many inches out of the direct

(B^{1}.) MODE OF ACCESS AND EGRESS.

line; whereas at a great depth you are always in the direct line with a flat rope.

16,689. Should you consider that a wire rope was likely to suffer injury from any description of copper water or other mineral waters which it might have to encounter in its passage up and down the mine?—I should think not. I believe that we have a case in the county of Durham where there has been the most deleterious water hitherto met with in connexion with metal pumps and tubbing and everything of that kind, and in that same place they were able to work wire ropes with safety. That is at a coal mine in the county of Durham, where they had very deleterious water indeed. They were obliged to use working barrels of different alloys of metals. In the volume of the "North of England Institute of Mining Engineers" for the year 1858 you will find a paper on that subject by Mr. William Armstrong, a mining engineer. In answer to that question, taken alone, I do not apprehend any difficulty at all; and I think that that is a good case in point where the water was such that in connexion with the pumping they were obliged to use means to counteract it. But in connexion with flat wire ropes, at that particular place, there was no such instance.

16,690. Supposing that there was anything deleterious in the water, could it not be obviated by passing the wire rope through a mixture of grease or other preparation?—Yes, to a certain extent, by keeping a mixture of oil and grease combined, very little water would adhere to the rope; but still, of course, if it came in contact to such an extent, there are waters which would be deleterious. I would, however, remark that there is no reason why it should be brought in contact with those waters, that is to say vertically; and even in an underlie, although there it is more difficulty to keep clear, I do not think that any practical detriment would take place. There might be drops of water upon the rope, but I do not think that it would come upon it to such an extent as to cause any detriment.

16,691. Will you state your reason for that opinion?—Partly from the grease and oil upon the rope, and also from the constant moving of the rope over the sheaves, its influence would be very different to what it would be supposing it were lying steeped in water of that kind. I do not think that it would be kept upon it, or that there would be anything of that kind for a sufficient length of time to cause any practical detriment. I think that if there was water to such an extent as to cause detriment of that kind, it would have a much greater effect upon a hempen rope. If you had water to such an extent coming upon it, it would have to be always what we may call poured down, and even under those circumstances I should prefer wire to hemp as a matter of economy.

16,692. (*Mr. St. Aubyn.*) Do you use wire rope in drawing the waggons along the levels?—Yes, and we have it at work in very wet places. That answer is in connexion with my practice as a mining engineer generally, and not with the Eston mines only.

(Bd^{1}.) *Wire Rope.*

16,693. Will you state the amount of difference which you have observed in the wear and tear of ropes used in those places, and of those used in perpendicular shafts where the water does not fall on them?—I am afraid that any answer which I should give would be mere guess-work.

16,694. Can you state approximately?—I cannot even state approximately.

16,695. Would they last half as long again?—The circumstances are very different, and the load to the wire ropes is very different upon the vertical to what it is upon the horizontal or nearly horizontal.

16,696. (*Mr. Austin Bruce.*) The friction is much greater upon the horizontal than upon the vertical?—Yes, and the loads are also different.

16,697. (*Mr. Holland.*) Is there any considerable wear of the rope if it is well held up by pulleys in the underlie?—No.

19,698. Is it not easily guarded from any great wear?—Certainly.

(f^{1})—DAY OR ADIT LEVELS.

(Bf^{1}.) *Day or Adit Levels.*

JOSEPH WHITWELL PEASE, Esq.

16,468. (*Chairman.*) Will you have the goodness to state to the Commissioners the way in which the men enter the mines?—They enter the mines entirely by what we technically term "from the day," by levels; they do not go either up or down shafts.

16,528. What is the length of the longest level?—About 800 yards.

Mr. JOHN MARLEY, Eston Mines.

16,630. (*Chairman.*) Do the men enter from the day level or horse level?—They enter entirely by adits or levels.

16,631. What is the length of the longest level?—The longest level is in connexion with the new mine we are opening, where there is a shaft, and it is very nearly a mile—1,672 yards—from the entrance of the adit to the shaft.

Mr. ADDISON L. STEAVENSON, Normanby and Skelton Mines.

16,734. (*Chairman.*) How do the men enter the mine?—At Normanby they walk in and out; at Skelton they have been going up and down a shaft, but I have now put a drift out to the surface, we are walling it, and it will be finished in a fortnight, and they can then walk in and out as they choose.

(C^{1}.) VENTILATION.

THOMAS ROPER, Esq.

12,220. (*Mr. Davey.*) Is your ventilation very good?—Very good generally; there is very rarely any complaint; we hear a complaint in very sultry weather; when there is very little current in the upper air the air below gets tainted and foul

Mr. ROBERT KENDALL, Lindale Moor Mine.

12,258. (*Chairman.*) Have you any shafts which are specially downcast or specially upcast?—Yes; the nature of our ground generally allows that to be the case. The shafts which are in the lowest ground are generally downcast, and those in elevated ground upcast.

HENRY WILLIAM SCHNEIDER, Esq.

12,416. (*Mr. Austin Bruce.*) Do you ever have complaints made directly to yourself of the want of adequate ventilation in any portion of the pit?—No, and for this reason, that it is a very rare occurrence that we are deficient in ventilation, and in all the cases where there has been a deficiency of ventilation I have invariably found that the captains have instantly come to the head captain and asked for instructions as to what they were to do to obviate the difficulty. It only arises from this cause, that under certain circumstances where we are obliged to drive a level to communicate one pit with another, we experience a quantity of light air just at the end of the level as they are approaching the communication, but not under any other circumstances. Summer weather affects us slightly, not from deficiency of ventilation, but from the deadness of the air; then the principle adopted is to hang a fire-pan in the pit, which in the course of two or three hours will just carry round a current, and then the air is perfectly right again, but we are not exposed to any bad air in the pits in the same manner as in coal pits.

(C^{1}.) *Ventilation.*

12,417. Do you find as a liberal owner of mines any tendency in your agents to stint the men of proper ventilation in order to prove that they are economical managers for you?—On the contrary, I find just the reverse, the very first thing that the whole of my captains attend to is ventilation, and for this very simple reason, that the moment ventilation is deficient that moment the wages rise in proportion to the work done, and that moment my attention is called to it, and therefore if they wished to do it they could not do it without my finding it out.

12,418. Then you have, in fact, no complaints made personally to yourself of inadequate ventilation?—Never.

12,419. (*Chairman.*) When ventilation is necessary, what means do you adopt?—In all cases where we are driving levels to a great distance we put in air pipes. The general plan which we adopt here is to have a hood similar to what is used for ventilating the stoke hole of a screw steamer or other steamer, and it is placed opposite to the way in which the wind is blowing, so that the wind blows down the pipes and along the pipes to the end of the level.

12,420. Do you use any other artificial means of ventilation?—We have repeatedly thrown water down the pits so as to drive a current of air into the workings, simply a waterfall.

12,421. (*Mr. Austin Bruce.*) As an occasional expedient?—Just as an occasional expedient.

12,435. (*Mr. Holland.*) If you have no regular upcast or downcast there must be some shaft up which the air which has been vitiated comes to the surface?—It is every shaft in rotation, exactly as the wind happens to be, sometimes the current sets in one direction and sometimes it sets in another.

12,436. Then the men must occasionally mount by the shaft up which the vitiated air travels?—No doubt, that is to say to the extent to which it is vitiated, practically there is no vitiation; I have never been able to discover the slightest difference in the air either in one shaft or in another. When you consider that there is an extent of ground open beneath, which amounts to something like six acres invariably open, and that the total number of men at a time does not exceed 130, and that there is in a great portion of the mine a very strong current of air blowing you will find that there can be no vitiation to a perceptible extent.

12,347. (*Chairman*). Do they use powder for blasting?—Occasionally, but it is only occasional when they are driving rock levels.

12,438 (*Mr. Davey.*) You have said that there is some foul air, is not that generally at the bottom of your deepest shaft?—We never get this foul air where there is water, the deepest shaft being the drainage shaft, there is so much water falling about that there is always a current of air kept up in that shaft, and although it has at the present moment very long levels attached to it there is no perceptible foul air in it.

12,439. When do you find the air so bad that you are obliged to put down a furnace?—We have not done it this year.

12,440. But you have done it?—We have done it. In the course of a year we shall perhaps find 2, 3, or 4 days when the air is very oppressive from a thunder storm coming on; it then is very dead, there is very little wind, instead of the air pouring through the mine in its usual course it seems to lie dead throughout the whole of the mine, and it would soon become oppressive if the men were allowed to go to work under those circumstances; they therefore put in a furnace, just sufficient to create a current of air to re-establish the equilibrium of the circulation of the air, that is all.

12,441. Then that foul air has accumulated during the time that the men are not working?—I want to draw a distinction (because it is important) that we have not what is technically called foul air in these mines at all, it is dead air, it is not foul air, because foul air conveys to everybody's mind the air which you have in coal pits; the only foul air that we have is when there is the want of a current, arising from the calmness of the air in very hot weather, and at a time when the air is oppressive upon the surface, there is a stagnation arising in the mines, which if not removed, would in course of time render that air unfit for the men to breathe from the exhaustion of the vital principles of the air.

12,442. That does not occur very often?—It does not occur on the average, more than three times in the course of a year.

Mr. RICHARD HOSKING, Parks Mousell, Whitrigge Mines, &c.

12,472. (*Chairman.*) Have you any machinery for blowing in air?—No.

12,473. What course do you adopt when it is necessary to improve the ventilation?—When it is necessary we put up pipes and raise them a good height above the pit; the air descends and draws the bad air out; it causes a ventilation. We put wooden pipes and fasten them to the side of the pit, and raise them in the air, and extend them into the level, and that causes a communication.

12,474. Does that take air down or bring air up?—It takes the air up.

12,475. How high above the surface of the ground do you take the pipes up?—Twelve to 15 feet.

12,476. Is that sufficient to make a current of air?—Yes; it is only required occasionally just for a trial pit or anything of that sort; we should not require it for working.

12,477 But for working you have a waterfall, have you not?—Yes.

12,478. Have you it now anywhere at work?—Yes, at Parks; that is for a drainage level at the bottom of the mine to communicate it with the other pits, and as soon as we can we put down those other pits to communicate with that bottom level, and then this waterfall would not be used.

12,479 You find the waterfall sufficient?—Quite.

12,480. Do you ever use a fire-pan?—Occasionally we have had to do so in summer, in case of very hot weather, but very seldom; perhaps for two or three hours in a day during the hot days of the summer. This summer we have never had occasion at all to use it except once, only one day.

12,481. What caused you to use it on that day; and how did you ascertain that it was necessary to use it?—There seemed to be a stand of the air; it wanted the current breaking; it waved backwards and forwards in the level, but would not ascend.

12,482. Who found that to be the case?—You found it in going down the pit.

12,483. Did you you discover it, or did the men discover it?—The men discovered it.

12,484. How did they discover it?—By the candles not burning.

12,485. Did they come up immediately?—Yes, and adopted this system.

12,486. How long had they to be off work?—Perhaps two or three hours.

12,487. After the fire pan had been put down two or three hours they could go back again?—Yes, by putting the fire-pan down it breaks the light air at the bottom.

12,490. (*Mr. Austin Bruce.*) Do you ever have any complaints of the men that they are working in insufficient air? No; they cannot work in insufficient air; the candle will not burn, that decides it at once.

12,491. A man may work in air that may be unwholesome, although it may not be bad enough to put out the light?—I do not think he can in these mines.

12,492. There are degrees of badness before a candle is put out?—We do not drive it to that extent as to put the candle out before we stop it. First of all, it burns upright; if the air is getting to be what we call impure or short of air (bad air we call it) you have to lower the candle more and more until it gets down on its side before you can get it to burn, and after you begin to lower it from a horizontal position then the grease begins to run on the wick, so that it puts the candle out of itself.

12,493. Is the heat very great below?—Not at all.

12,505. (*Mr. Kendall.*) With regard to the ventilation, did you ever suffer much from bad air there, so far as 100 fathoms goes?—No, I never did. Sometimes, in driving a level, before you could communicate, the air was not good.

12,506. You do not see much difference between the air here and in Cornwall?—Not at all.

12,507. What do you call the air here?—I consider that here it is very good air indeed, but we are not plagued here with the powder smoke which they have in Cornwall our air is purer, we have not the sulphur in the working of the mine the same as they have there; there may be some little impurities there which we are not troubled with here.

12,508. If I understand you, generally speaking your air is good, but when it is bad air it is very bad?—Yes.

12,509. There is not much degree about it, it does not get from bad to worse?—You feel first that the candle will give way and the next thing is that you will feel a want of breathing.

12,510. When the air is at all bad it is generally distiguished by being very bad?—Yes.

12,511. Is that rapidly?—It will vary in the distance that you are extending your level; another thing accounts for it, namely, the way in which the wind blows on the surface.

Mr. STEPHEN JACKSON, Lindale, Cote, and Ure Mines.

12,564. (*Chairman.*) In these workings, have the men ever found fault with the air?—Very rarely.

12,565. But they have sometimes?—Sometimes, in a very extraordinary hot time.

12,566. What means do you then adopt?—We have a fan blast.

12,567. How is that worked?—By a boy from the surface.

12,568. That forces the air down what kind of pipes?—Through wooden pipes.

12,569. What is the size of those pipes?—I think they are about five and a half or six inches square.

12,570. Are they taken that same size the whole way down?—Yes, and forced into the drift.

12,571. How are the wooden pipes made air-tight?—They go one into another, and they are clayed at the joints.

12,572. Are they mortised in the wood, or is the wood merely nailed together?—It is nailed together; it is planed and put together with white lead, but we very seldom have occasion for them.

12,673. When you have had occasion for them, what has caused the necessity to be apparent to you?—The heat of the atmosphere.

12,574. Have the men complained?--Of course the men make a complaint to the underground agent.

12,575. How do they ascertain that the air is light?—When they cannot keep their candles burning.

12,576. They have no other means?—No. If they find that the candles will not burn well, they say that there is not sufficient air to work.

12,621. (*Mr. Austin Bruce.*) Did you ever know the men complain of the ventilation without reason?—No, I do not think they do.

12,622. Have you ever known any complaint not attended to?—No, it is our interest to attend to it. If the men cannot work without air, we must get it for them. The new mine which we are opening out now will be upon a much better principle than the old one was, for the main drain which we are taking up, will afford ventilation from one end of the mine to the other; and all the mines which we sink independently of that will be connected.

12,623. Then if the ventilation of this mine is better, in the former works it must have been worse?—Yes. I am speaking of the same works about which the gentleman was asking me before.

12,624. Were the men none the worse for working in the inferior air?—They cannot work at all in inferior air.

12,625. But they did work in these pits which were not so well ventilated as those which you are now going to work?—So soon as they find that the air is not good, they cannot work, and they come up, and they must do so.

12,626. There is a degree of bad air in which a man may work, although he is not forced to relinquish work?—Perhaps there is.

12,627. Was not that the case in the pits which you say were less ventilated than those which you have in hand?—It must be so till there were such appliances as would make them better.

12,628. Nevertheless do you say that the health of the men was satisfactory?—Entirely so.

12,630. (*Mr. Kendall.*) What I understand you to mean by better ventilation under the present system is, that whereas under the old system at times there was bad air, and the men could not work and did not work; by the present system men will be able to work on?—Yes, clearly so.

12,631. Though they could not work at times in consequence of bad air, yet those times were few and far between?—Yes.

12,632. And that will be now remedied?—Yes.

12,633. The men did not suffer?—No; not in their health.

EDWARD WADHAM, Esq.

12,677. (*Chairman.*) Are not what they call air levels from one shaft to another generally driven preparatory to working a greater depth?—We drive the air levels in the course of our regular workings, and we leave the old drifts above with troughs in them to form air levels after they are done with. When we have done with a drift (which closes in, in the natural order of things), it is filled full of troughs to convey the air; it gets squeezed down to that small size, so that afterwards it is preserved as an air course; by that means the troughs carry the air.

12,678. What are the troughs made of?—Wood.

12,679. Is that sufficient?—We have always found it so.

12,680. Must they not crush in at times?—By that time we have other air courses open. The whole system of our working is a system of air courses. We only depend upon the troughs just for a temporary arrangement; they eventually become closed up. We are obliged in our mining here to make fresh arrangements continually. You cannot sit in an office and say, "We will bring our air round here," and so on, because our top is continually comin down. We have no roof. We are always making provision below while we have that above as a safeguard.

12,681. What artificial means are used in these mines for ventilation?—It is seldom that it is required. When it is required two methods are adopted, either hanging a fire-pan in a shaft, and thereby drawing the air, or putting down pipes, and attaching a fan blast, and forcing the air down.

12,682. Do you ever use a water blast?—We have no water blast in the mines under my charge.

12,683. Have you ever been in any of these drifts when the air has been bad?—Yes, upon one occasion.

12,684. Did you feel the effect yourself, or did you see it?—I feel it myself.

12,685. What was the sort of feeling?—A kind of feeling of want of air altogether, which would cause fainting.

12,686. Not excessive heat?—No, just a dulness, a want of ventilation.

12,687. Did the candle go out?—No.

12,688. (*Mr. Holland.*) Did it feel cold?—No, I felt a gradual sinking.

12,689. (*Chairman.*) So that that may happen although the candle does not go out?—It may happen although the candle will burn, but burn dull.

JOSEPH RAWLINSON, Esq.

12,774. (*Chairman.*) What means do you adopt when the air gets foul?—We generally have air passing from one pit to another, so that we get a regular communication, and in some cases, where we have an air way closed up (sometimes we go through clay) we put in a wooden trough about 12 inches square, which forms an air-way, that is a temporary act, comparatively speaking, in case that some of the drifts should get closed.

12,775. Have you never in your workings found that the men's candles would not burn?—In some instances, but it is very rare.

12,776. When that is the case what do you do?—We should blow air in, or get a communication to another shaft as quickly as we possibly could.

12,777. Till you get a communication to another shaft, what means do you adopt?—We sometimes blow in air, either with a bellows or with a fan blast in some cases.

12,778. How is that fan blast worked?—By the engine or by hand.

12,779. Have you one fixed to the engine that we could see?—Not at present, we have no occasion for anything at present, but we have had such occasion.

12,780. Have you one on the mine that we could see?—We have a large cylinder bellows which you could see that we have used for blowing the air into one pit where we have not a sufficient room of royalty to have an air pit conveniently, and we adopted that plan, but it is not working, and has not been for three years.

12,781. Of what kind is that?—It is a large round bellows, a sort of cylinder bellows, and it blew quite sufficient air in.

12,782. (*Mr. Holland.*) Working in water?—No; a common bellows, the same as the blacksmiths occasionally use, but on a larger scale.

12,783. (*Chairman.*) Was the air blown down wooden pipes?—Gutta percha pipes.

12,784. Of what diameter?—Three inches.

12,785. You found that to answer?—It answered very well indeed.

12,786. To how many men did it supply air at the end of the drift?—About ten men in the pit.

12,787. You do not use much powder, I suppose?—Very little powder indeed, but in that pit we had a few shots every day.

12,788. Was what you have mentioned the means of dispersing the smoke?—Yes; it deadened the smoke and the men could work very comfortably.

12,789. Have you ever observed how soon the smoke got away so as to let the men in?—It drove it away from the fore-breast so that the men could work, and after that it got so much deadened that the men did not feel the effects of it much; the men were away a very short time.

12,790. Do you remember about the length of the gutta percha tube which you had?—It would go down the pit about 55 yards deep, perhaps; and I think there were some 70 or 80 yards from the pit bottom; that would make about 130 yards. It was an expensive pipe; I should say that it cost 40*l*. or 50*l*. altogether, but it was very effectual for a temporary thing of that sort, where you could not get an air-shaft down well.

12,794. Did you ever see a fire-pan used in a shaft for ventilation?—I have seen it, but it is very rare that we have occasion to do so. We have not a fire-pan about our place.

12,795. Is it effectual?—It is effectual when the air gets dense in the pits. When there is a communication between two pits, and it is dense and will not circulate it is effectual; it circulates the air, and makes it clear in the interior.

12;796. And creates an up-cast current?—Yes, if ever we want circulation we only throw some water down the pit, and that creates a circulation without any more bother.

12,797. (*Mr. Holland.*) It falls freely down the pit?—Yes.

12,798. And carries the air with it?—Yes, and makes an up-cast draught at the other pits.

12,799. About how much water is required for it?—We let all the column go down, it is only for a short time.

Mr. JOHN LINDOW, Wood End and Gutterby Mines.

12,879. (*Chairman.*) Do you never, when driving a drift through stone, meet with poor or thin air?—Not if you ventilate the place properly; if you do there is no impure air whatever.

12,880. Is there any air in your mines in which the candles will not burn?—Yes, frequently; if they do not ventilate that drift they will find that the candle will gradually die out of itself, unless they resort to some means to prevent it; if they are driving a drift, but we have none at present. It is 12 months since we had one at which we put a pit down merely to ventilate it at the end of the drift, and to ventilate the adjoining pit.

12,881. Until that connection was effected was the air such that a candle went out in it?—Yes; that is to say, it did not go out, but it did not burn well.

12,882. Did you resort to any artificial means for improving the condition of the air in that case?—We conveyed tubes in a box, pipes to convey the air in to the fore end of the mines.

12,883. Were any means employed for the purpose of forcing air in?—We have frequently employed such means upon former occasions, but latterly we have not; we have sometimes applied a fan.

12,884. In what way was the fan worked?—It was worked by hand by two men.

12,885. Was it so worked on the surface?—No; it was near the foot of the shaft, they could not have driven it from the surface; the air at the foot of the shaft on the low level is equally pure.

12,886. Should you call the air in the low level poor air?—Yes, but it is not inflammable.

12,887. On the occasion to which you have referred, before you succeeded in making a communication, how were you able to resort to these means?—We had a connection formed; we did not work long before we got a connection with the adjoining shaft.

12,888. Did you work as long as a month?—Yes, and more than that. During the time that we are driving to this place the men can work in the fore end with the candles standing to one side. In our case the candles were not required to incline; but that does frequently occur.

12,889. How long do you imagine the men had to work as you have described before the circulation was completed, for three or for six months?—In the drift which I have mentioned I do not think in driving to the shaft which we were putting down, that the men would have been at work there more than two months. We were working our adjoining drift that I am now speaking of; and it was to take so much of the drift out towards going to the upper shaft which we were sinking for ventilation, for air.

12,890. While you were there driving, am I to understand you to say that the candles never went out?—Not altogether; still the place was not what you call so pure as the other part of the mines.

12,891. Did you find the wooden box or pipes to which you have referred answer the purpose for which it was used?—Yes, until we got the drift through.

12,892. Was there much blasting carried on there?—Yes

12,893. Did much time elapse before the powder smoke was cleared away?—No; it is advantageous, of course, to get it away quickly.

12,894. How long was it before it was cleared away?—That is a matter which depends entirely upon the management of the person driving the air into the working, I mean the person at the fan.

12,895. If he did not attend to it, what would be the consequence?—That the air would be so much longer in coming out

12,896. Have you ever employed any artificial means, such as an engine, independently of men driving a fan?—You cannot get water at a place of this kind. When you speak of an engine, I may say that we frequently apply water to clear a shaft in sinking it. You merely apply water to clear it in a few seconds.

12,897. Do you let the water go down?—Yes, in order to force the impure smoke up.

12,898. In that case the water has to be pumped up again?—Yes, but that is really nothing as compared with keeping the men out of the workings.

12,899. Have you ever seen any of these fan machines driven by an engine?—Yes, but not by us.

12,981. (*Mr. Kendall.*) You have stated that you sometimes have had air; in the instance that you referred to, do you happen to recollect the length of the drift before you communicated at all?—Between one pit and the other I dare say, where we put down the air shaft, it would be 73 or 74 yards.

12,982. How many yards were you in before you felt any difference in the air?—A great distance, up to the rise before we felt the least difference in the air; as long as we could work in the ore before we came into the stone drift we had no difficulty in ventilating; in case you cut through a pillar you thirl through it, and you bank it up.

12,986. Suppose you were driving through the ore with a view to ventilation, and you were to pass from the ore into the rock, would there be any difference then?—Yes, certainly.

12,987. (*Mr. Austin Bruce.*) Do you manage the details of the ventilation yourself, or do you entrust the management to an agent under you?—It is entrusted entirely to our own manager who is my nephew.

12,988. Do the miners ever make complaints to you of what they consider a deficiency of air?—No, I do not know that we have had any complaints made for a great many years.

Mr. James Dees, C.E., Parkside Mines.

13,123. (*Chairman.*) Do you adopt any particular mode for ventilation?—We have a connection between all our pits, and the air has a free course through from one to the other.

13,124. While working the pit, have you never had any place where the air has been dead or poor?—We have in one solitary instance I think; we had to put up what we call a brattice in the middle of the drift to get a connection with another portion so as to get connected with another shaft, and that effectually cured it.

13,125. Was this drift through the ore or in the rock?—In the ore.

Thomas Ainsworth, Esq.

13,176. (*Mr. Davey.*) How is your mine ventilated?—We have shafts; where we have very long workings we divide the air as you would in a colliery.

13,177. You brattice it?—Yes. The manager of my iron mines was formerly the manager of my coal mines, and therefore, where it is necessary, we provide them with bratticing.

Mr. Archibald Bell, Cleator Iron Ore Mines.

13,193. (*Chairman.*) Was the 12-fathom shaft sunk for the purpose of ventilation or for the purpose of getting ore?—It was sunk in the first place for the purpose of getting ore.

13,194. Is it still used for that purpose?—Yes.

13,195. What is the distance between those two shafts?—It is, I think, somewhere about 20 yards.

13,196. Is there any communication between them?—There is a drift put through from the deepest pit to the 12-fathom shaft going up to it.

13,197. And that answers the purpose of ventilation without any artificial means?—Yes; we have a division in the pit, the air coming down the one side and returning up the other shaft.

13,198. Does it always go up the one shaft?—Sometimes it will take a turn. A bogie will very often turn the air in going down and put it in its right course again.

Mr. George Dixon, Winder and Yeathouse Mines.

13,274. (*Mr. Kendall.*) I understand from you that you have got two shafts, one at each end of these 300 yards' workings?—Not at each end.

13,275. I am right in supposing that your main working is about 300 yards long?—Yes.

13,276. And that you have a transverse working of about 60 yards?—Yes.

13,277. In the 300 yards you have two pits; whereabouts are they situated?—The extent of workings in one case to the dip of one pit is 400 feet and to the rise 250 feet from the other pit.

13,278. Are the transverse workings as well ventilated as the long workings?—Yes, we put stops in and carry air boxes which can supply any amount of air. We make use of those when necessary.

13,279. You find that by these divisions and trap doors, and so on, you can convey a draught when you like without any fans?—Yes; sometimes in long drifts, when there is no communication with any other workings, we put in a fan.

13,280. In the course of the year have you a fan working three months?—No.

13,281. How many fans do you use?—We never used more than one fan.

13,282. And perhaps upon the whole you use it one month out of twelve?—No, it is very seldom used at all.

13,283. Generally speaking the ventilation is as good as can be?—It is.

13,284. (*Mr Holland.*) When did you work the fan last?—Four or five years ago.

13,285. (*Mr. Austin Bruce.*) You have no difficulty with the ventilation?—None whatever.

13,286. Do you conduct it on the same principles as the ventilation of the collieries with which you are connected?—Generally speaking so. Of course we have not the same opportunity in an iron mine as in a colliery; the workings in a colliery are a great deal more regular, laid out with regular boards and headways.

13,287. In the iron mines have you a regular up-cast and down cast?—Yes.

13,288 Does the return air always pass up the same up-cast shaft?—Yes; it cannot get to the other.

13,289. (*Chairman.*) Why?—Because it is occupied by the down-cast air.

13,290. (*Mr. Austin Bruce.*) You have so arranged it that the up-cast shall always be the up-cast and the down-cast the down-cast?—Yes.

13,291. Is that usual in the mines in this neighbourhood?—I can scarcely answer that question.

13,292. What means do you take to conduct the air so as to secure the same up-casts and down-cast in all temperatures of the outside air?—In each of the mines of which I am now speaking, namely, the Yeathouse and Winder mines, we happen to have an underground engine; and the discharged steam is carried to the up-cast shaft in both cases, which of course secures that particular result.

13,293. Do you take much pains to prevent the leakage of air into any other than the proper channels?—We do not find it requisite at all.

13,294. Not to the same extent as in collieries?—Certainly not.

13,295. Is the stream of air which you send through the iron mines equal in volume to that which you send through collieries?—That depends altogether upon the extent of workings.

13,296. I mean supposing other things equal?—I should say that as great an amount of atmospheric air goes into our iron mines as goes into collieries.

13,297. Are there not fewer impurities to struggle with in the mines than in the collieries?—Yes.

13,317. (*Chairman.*) Are the drifts driven far from the shafts or from the day?—I should think that the extent of drifts and workings may be assumed at from 300 to 400 yards from one extreme to the other.

13,318. Is there any difficulty then in supplying the men with air when they are driving a drift?—I have never seen any myself.

13,319 Have you any artificial means for supplying them?—I think at the Goldscope Mine I have seen them use zinc air pipes in some of their long drifts, and the ventilation is produced by what they call a water blast, the falling of water.

13,320. Do they report to you when anything is necessary in the way of ventilation?—No.

13,321. That is left entirely to the manager?—It is.

Joseph Whitwell Pease, Esq.

16,740. (*Chairman.*) What is the greatest lenght of any level?—The greatest lenght of any level that we have is 1,820 or 1,830 yards.

16,471. Is that in a straight line from the day?—Almost stright; there is a slight curve in it.

16,472. Do you work by cross-cuts from that?—Yes.

16,473. Do you find any difficulty in ventilating the mines to the extreme ends?—We have had none at all; we have adopted the ordinary mode of ventilation that is generally used in coal mines, by a furnace, and in these mines we have five ventilating shafts. The furnaces are now working in four of them, each of these shafts is six feet in diameter, the depth varying from 10 to 30 yards; there are only two furnaces to the dip; they each produce about 27,000 cubic feet of air per minute per furnace.

16,474. Does the air enter by the level?—Yes; and after passing through the workings of the mines returns to the furnace, which is not very far from the entrance of the level in the back course; every level is driven double.

16,475. Have you two up-casts in the whole?—Yes; at the present moment every level is driven double, and cross cuts for ventilation as far as it will go in.

16,476. What is the size generally of the levels that are driven?—They are five yards wide; and the height of the stratification varies from six to seven feet.

16,477. Do you find that the furnace not only ventilates but also has the effect of drawing the smoke away?—It draws the "powder reek," as it is called, away, and also the foul air that is generated by the horses and men; but we have never tried, and I believe there has not been tried any other mode of ventilation in the Cleveland mines, coals being cheap and the furnace always being considered the most effectual method.

16,479. Are you obliged in order to make this furnace work to have any trap-doors or any similar contrivances?—Yes; the whole of the return air is regulated by trap-doors, with boys to attend to them, to see that they are shut.

16,480. And occasionally it is carried across the levels?—Yes; it is carried across.

16,481. In brick tunnels?—Yes, or else in closely planked wooden ones; but we prefer the brick ones.

16,482. Do you know the quantity of coals that one of these furnaces consumes?—About a ton and a half a day, I think, is the average quantity in each of them.

16,483. What is the price of coals at the present moment?—About 5*s.* a ton.

16,484. Is the furnace any larger than is absolutely necessary for the ventilation?—No, I think not; but the air in all our mines is exceedingly good.

16,485. You think it requires as large a furnace as you have described?—Yes; the difference between the quantity of coals is so small, and the better the air the better your mine is liked by the men.

16,486. If the miners are driving any foul ends have you any means of supplying them with air?—None, but having the air very regular in the rear of the men; if we only drive one end we have no return course, except the cross-cut immediately behind them.

16,487. Do you find that in driving a headway there is ever any deficiency of air?—No; as soon as it gets close or uncomfortable for the men, we cross-cut immediately, closing the cross-cut behind.

16,488. What distance would you leave?—Our cross-cuts are only about 10 yards apart; the men are close to the air the whole time. If we did drive a headway further we should divide it by a timber or cloth brattice; you can carry that close up, and to so great an excess will you have good air that you will make the men so cold as to make the men uncomfortable.

16,489. Have you ever used a cloth brattice in the iron mines?—No.

16,490. You use powder, I presume?—Yes.

16,491. A cloth brattice is used in coal mines?—Yes.

16,492. Does it answer perfectly well for the purpose?—I think that they generally prefer timber as being more durable.

16,493. But supposing it was only required for a short time, should you use it?—Yes; we saw regularly for the collieries brattice deals, very thin; they are easily nailed up and taken down again.

16,494. Would not the cloth answer?—Yes, very effectually; we have employed it in sinking shafts.

16,495. You have divided them with cloth brattices?—Yes, and they have answered perfectly well.

16,496. For creating a circulation, or for making a return current?—Yes.

16,530. Have you one furnace at work there or two?—There are four shafts, producing a current of air equal to about 50,000 cubic feet of air per minute to each furnace, all of them having furnaces in them.

Mr. John Marley, Eston Mines.

16,632. (*Chairman.*) How many shafts are there in connexion with it?—There is only one shaft at present, in connexion with the centre of the mine; but near to the adits there are other three or four shafts, of which we have taken advantage to get furnace power for ventilation

16,633. The mine is ventilated, then, by means of a furnace?—Yes.

16,634. How many furnaces have you?—We have three furnaces, one of which is a double furnace. No. 1 furnace is 18 feet long by 9 feet broad, and is fired from the side. The double furnace is equal to a furnace of 18 feet broad by 9 feet long. The third furnace is only a small one, and is not at work at present, and of that I have not the dimensions.

16,635. Is the double furnace so constructed that it communicates, as it were, from back to back?—No, they are two separate furnaces in connexion with one shaft.

16,636. For what extent of level should you say that one of these furnaces is sufficient to drive away, not only the foul air but the powder reek?—It would be almost impossible to give you an answer to that question, unless you defined the rise and the dip of that level. In fact, there is no rule that will apply to it. The way in which we ascertain whether we have sufficient ventilation or otherwise, is to test the air per cubic foot per minute

(C^1.) *Ventilation.*

that we have per man, and seeing what that is, we then judge as to whether that is sufficient to take away both the powder smoke, and to move any gas or anything that might be impure The average ventilation in our mines for the last three months has been 77,555 cubic feet, the minimum being 70,920, and the maximum 96,895, one furnace not being at work. Taking the number of men and boys underground at 618, and putting 80 horses down making an aggregate of 780, we have 111 cubic feet per minute per man, boy, and horse, driven through the various furnaces and circulating through the mine. Then, inasmuch as a man requires only about a fifth part of a cubic foot per minute for actual inhalation, to enable him to live, if you have 111 cubic feet that gives a very large margin beyond. But inasmuch as these are never all in the mine at the same time, the margin is greater still.

16,637. I driving a fore end, do you think think that the ventilation is sufficient?—Yes, quite sufficient.

16,638. How long would the powder smoke hang in one of those ends after the blasting had taken place?—It would vary somewhat in the different parts of the mine. In our mines perhaps a little longer, on account of the great height of the mine, that varying from 12 to 15 feet. But although we obtain a large number of cubic feet per minute, yet, on account of the large area, we do not attain the great velocity that there would be in a thinner mine. Hence the powder smoke is a little longer in getting away, although it is diluted to below the injurious point much more than in a thinner mine, still it is a little longer in getting away; I should think about 10 minutes.

16,639. Owing to the larger space in which it is, of course you cannot exhaust, as it were, the air so rapidly?—Suppose a given quantity of powder smoke to be given out at a shot, I should say that in a seam of three feet thick, and having the same quantity of air, it would move much quicker than in a seam 12 feet thick, although you may get it diluted to a greater degree you do not get it away quite so quickly.

16,640. (*Mr. Holland.*) It is a larger but a thinner cloud?—Yes; that it is.

Mr. Addison L. Steavenson, Normanby and Skelton Mines.

16,763. (*Mr. Austin Bruce.*) Do you ever have any complaint from the men as to deficient ventilation?—Nothing of any moment; for two or three days perhaps a place might be rather slack, until it got holed in another place.

16,764. In those cases do you apply any special means of ventilation?—Yes, we have a pump going in one case pumping 200 feet a minute for two men.

16,765. (*Mr. Kendall.*) What is the distance off?—About 30 yards from the main airway; it is owing to the large amount of stithe which is given off in that particular case, that is, carbonic acid.

16,766. (*Mr. Austin Bruce.*) Have you ever found the health of the men affected by breathing that gas?—My experience has not been long enough; I have not seen any men any worse for it, they have not complained to me.

a^1.) *Poor r.*

(a^1.)—POOR AIR.

Mr. Andison L. Steavenson, Normanby and Skelton Mines.

16,773. (*Mr. Kendall.*) Have you more carbonic acid gas in your mine than in the mines in the neighbourhood?—I should think that we have; we have rather more troubles in the strata, and we are putting through what is called a trouble where this is coming off.

16,774. How does it come off, is it through fissures?—Yes.

16,775. Do you ever apply your candle there to see the effect of it?—Yes.

16,776. Does the candle go out instantaneously?—Yes.

16,777. Supposing that you put your candle in the centre of your fore-head, would it generally burn there?—It would burn dimly; that is in the place of which I have been speaking of, of pumping the air in.

16,778. But when you pump the air in, does it burn well, or does it always burn dimly?—It generally burns dimly if the pumps are not going, but if we set the pumps going it makes the place fit to work.

16,779. Although it is diluted largely, is it perceptibly different from the other ends?—No; I cannot say that it is.

16,780. Though you are in a trouble, still by the application of this pump you so dilute this carbonic acid gas that the men are able to work freely?—Yes.

16,781. (*Chairman.*) Is this at the Normanby mine or at the Skelton?—The Normanby mine.

(d^1.)—DUST.

(Cd^1.) *Dust.*

Mr. George Dixon, Winter and Yeathouse Iron Mines.

13,323. (*Chairman.*) Do you know of any peculiar illness to which they are subject?—They are sometimes subject to some disease in the lungs, I fancy caused by breathing stone dust produced in the process of working.

13,324. There is a good deal of dust?—Yes.

13,339. (*Mr. Austin Bruce.*) Whence does the dust which you speak of as affecting the lungs of the miner in lead mines arise?—I suppose from the character of the rock, the mineral itself in which they work.

13,340. Is it after blasting?—Not after blasting, but in the picking and the general working in fact. They are breathing an atmosphere charged with a certain amount of heavy dust coming from the rock in which the lead is deposited.

13,344–5. (*Mr. Davey.*) What effect has the dust, which you speak of, upon the breathing of the men?—I could not answer that question, that is more perhaps a medical question; I am only speaking generally.

(f^1.)—SMOKE FROM POWDER.

(Cf^1.) *Smoke from Powder.*

Mr. Robert Kenball, Lindale Moor Mine.

12,307. (*Mr. Austin Bruce.*) As a rule how does the smoke disappear after a blast?—It sometimes remains perhaps 10 or 15 minutes, if it be dull heavy weather, and if it be a good sharp drying blast we have it out in less than five minutes.

12,310. You have never known the men suffer from breathing the smoke?—No, we always consider that it is rather healthy.

(h^1.) MODES OF PROVIDING VENTILATION.

(Ch^1.) *Modes of providing Ventilation.*

Thomas Roper, Esq.

12,221. (*Mr. Davey.*) What means have you of improving ventilation at any time?—Most of our mines are connected one with the other so that the one operates as a down shaft and the other as an up shaft. If, however, that is inoperative we employ a fan occasionally to blow the air down, a fan which we can move from one shaft to another. In many cases we employ a fire-pan, we fill a pan of cylindrical shape made of open grating with quite dry wood, and when it is furiously burning we let it down the shaft by a chain and it will go down glowing.

12,222. (*Mr. Austin Bruce.*) That is down the upcast shaft?—Yes.

12,223. (*Mr. Holland.*) About how far is the fire pan lowered?—It depends upon how far the bad air has risen in the shaft.

12,224. About how deep is it generally lowered, 20 or 30 yards?—Of course it must depend upon the depth of the shaft itself—40 yards or so.

12,225. Is not it rather a weak draught if it is only 40 yards high;—Perhaps I do not make myself quite understood; the shaft or pit from which all the ore is drawn is 50 yards deep; the men say that the air is tainted, and that they lose their light and the moment they lose their light they come out of the place, and we immediately set to work to remove the tainted air, and we do it by letting this fire pan down, and it goes down and down until it comes to the tainted air.

12,226. (*Mr. Davey.*) What is the effect then on the air?—It creates a vacum as it goes down, I imagine. The moment it comes into carbonic acid gas or anything which is more or less tainted with an excess of carbonic acid gas, there is nothing to support combustion, and the fire goes out. I do not know whether I am right or not, but when the pan is going down I imagine that it is creating a vacuum by its own consumption; the air is perfectly still in the shaft. If there were a current in the shaft, if it were lively, it would not be required; so that I imagine that this is a perfectly calm atmosphere where it is going down, and it removes the oxygen as it passes down and destroys a great amount of the volume of the air, and to supply the vacuum the heavier air rises, and after a while it comes out like a cloud; it comes out perceptibly.

12,227. (*Mr. Austin Bruce.*) Then do you mean to say that the fire is not extinguished till all the bad air is removed?—The fire-pan goes out, and we lift it again and ignite it again; the second time it has not to go so far down the shaft, and so gradually.

12,228. (*Mr. Davey.*) Do you bring it up again to ignite it?—Yes, and fill it again with wood, and it goes down so much less each time.

12,229. (*Mr. Austin Bruce.*) Has this operation to be performed often?—No; perhaps eight or ten times in a year.

(C^1.) VENTILATION.

Modes of

12,230. (*Mr. Davey.*) I presume that you drive galleries in the ironstone?—Yes, from the shaft.

12,231. After you get in a certain distance, how do you find the air? how far can you drive without putting in a fan?—That would depend upon the state of the atmosphere above. When you have a lively current above you can drive 20 or 30 yards, and have good air in all the way. Most of the drifts will not be more than about 30 yards, then they come back again towards the shaft.

Mr. Robert Kendall, Lindale Moor Mine.

12,260. (*Chairman.*) Supposing they are affected by the weather, what means do you adopt to create an upcast?—We generally put down an open fire-pan filled with chips and shavings, and when we have good air outside we generally succeed in getting a good draught.

12,261. Is it affected by the direction of the wind or by the want of wind?—It is generally by the want of wind. In sultry thundery weather it is worse. For instance, if there be a thunder storm rising we generally find the air affected by it.

12,262. (*Mr. Holland.*) When the external air is hot it spoils the draught?—Yes, in a great measure.

12,262*a*. Do you find a difficulty in stirring the air with the fire-pan?—We never find a difficulty when we put fire-pans on.

12,263. (*Chairman.*) When do you consider it necessary to put fire-pans on?—When the draught is completely at a stand still and does not work either way.

12,264. How do you ascertain that that is necessary?—Because the candles will not burn.

12,265. Have you any other means of ascertaining it?—No.

12,266. Do the men feel the effect of it?—No; I have never known any man affected by what we call bad air, because the candle ceases burning. I have no doubt that if they remained for a length of time after the candles went out that might be the case, but I have not seen it in my experience.

12,267. Do the men leave the work as soon as the candles go out?—Yes; at once.

12,284. (*Chairman.*) Do you put on doors to regulate the ventilation?—Yes.

12,292. (*Mr. Austin Bruce.*) You say that when the candles go out the men complain to you and you take methods for improving the ventilation?—Yes.

12,293. Do you think that a man can work healthily and well in air, which, without actually putting out the candle makes the light weaker than it ought to be?—I do not think that they can, and in fact, if it does not actually put the candles out, but there is a want of air, we apply some method to relieve them.

12,294. Do you ever apply these methods before the candles refuse to burn?—Yes; we always provide for them; we have many cases where we gain ventilation without being subjected to the candles going out for want of air, but we always take this precaution to get our connections as quickly as we can.

12,295. Where, as a rule, is the ventilation weakest?—If we have cut air courses I do not know that there is any such bad air, but it generally happens that when we have no air courses, and are driving in among old workings for connections with another shaft we find the air worse there.

12,296. And you then introduce artificial ventilation?—Yes.

12,297. What do you mean by "air courses" in your last answer?—By air courses I mean one shaft being connected with another, so that air can go between one and another.

12,298. Are all those courses 6 feet by 6?—Yes; when they are first made, but they gradually get closer and closer, and we have sometimes another air course going on at the same time when, this is at work, it requires that on account of our bad ground.

12,299. Does it ever happen to you, when you have received a complaint that the ventilation is bad, although the candles are not actually put out, to examine the ventilation and to find that the complaint is unreasonable and unnecessary?—I have never had a complaint to me where it has not been reasonable and necessary, for I generally keep a very strict control, as regards ventilation, and I do not allow the men to go to work there if the ventilation be not good; if it be bad we always contrive to improve it by artificial means or by air courses.

(j^1.)—FAN WORKED BY A BOY.

(Cj^1.) *Fan worked by a boy.*

Mr. Robert Kendall, Lindale Moor Mine.

12,243. (*Chairman.*) Which are the more difficult to ventilate, the lower drifts or the drifts where you are working?—The lower drift is more difficult to ventilate in general.

12,244. What means do you take to ventilate those lower drifts?—We contrive to make upright rises into an air drift and connect that by ventilation with another shaft.

12,245. What distance is there between the working drift and the drifts which you are driving for after working?—It just depends upon circumstances, provided we were putting down a shaft we might put it down 10, 12, or 15 feet lower than where we were driving.

12,246. And then you would put in a drift to join that shaft?—In some cases we do.

12,247. Do you adopt any artificial means of ventilation?—When we have not ventilation by a shaft, but by driving a level to meet one, we generally apply a fan blast.

12,248. How is the fan blast worked?—By pipes down the shaft and blown from the surface.

12,249. By means of an engine?—No; we always employ hand labour for it, but that is only very temporary, just while we take one heading.

12,250. Does a man work it at the surface?—Yes; the man who attends to the fan blast.

12,251. He drives the air down the bottom of the shaft and then along the drift?—Yes.

(n^1.)—FURNACES.

(Cn^1.) *Furnaces.*

Mr. Addison L. Steavenson, Normanby and Skelton Mines.

16,784. (*Chairman.*) Have you any furnace?—We have two small furnaces, and I am putting up a new one which is larger.

16,785. Do you think that the two furnaces are not sufficient?—In the summer they are not sufficient.

16,786. Have you made any calculation as to the size of the furnace required?—I am going to put up one six feet square.

16,787. Do you make any calculation of the number of men working as to the size of the furnace?—I have not done so; I know pretty well the effects of the furnace; it varies according to the circumstances of the mine.

16,788. Will that furnace, in your opinion, be sufficient to extract this carbonic acid gas?—Yes; it will pass off as soon as we get holed to where we intend to go.

16,789. But even with the furnace it would not be sufficient without putting in air to that point where you say the carbonic acid gas is?—The furnace would be sufficient.

16,790. Supposing you had another furnace in now, would that be sufficient without introducing air?—Yes; this is a drift which is going to hole into another mine in the course of less than 100 yards.

16,791. It has no communication with the rest of the mine at present?—No

16,792. It is a new drift?—Yes.

16,793. How far is it from the day?—700 yards, and it is there that we meet with the stithe.

16,794. Does not that drift communicate with the other parts of the mine?—We can walk into it from the other parts of the mine.

16,795. Cannot you extract the air?—When you go into a single place without any communication, the air falls dead.

16,796. If you bratticed that, would it not have the desired effect?—We have not yet sufficient furnace power to draw it through.

16,797. If you had sufficient furnace power, then you think that a brattice would be beneficial?—Then we could draw it through.

16,798. How long do you think you will be in getting to this state of things?—By the end of the year.

16,799. In the meantime will not the men, in your opinion, suffer?—I will take care that they do not.

16,800. How will you take care that they do not?—By pumping in sufficient air.

16,801. How is the pump worked?—By hand.

16,802. Where is it placed?—About 40 yards back from where the men are working.

16,803. Is there any communication with the outside air where it is placed now?—Yes.

16,804. At the point where this hand machine is placed, how near is the communication with the day?—I do not quite understand the question; it is 700 yards from the day.

(C^{1}.) VENTILATION.

(C^{1}d.) *Furnaces.*

(C^{1}d.) *Furnaces*

16,805. And this is 40 yards from the pumping?—Yes.

16,806. Then, I suppose, it is 660 yards from the day where the men are pumping?—Yes.

16,807. And you are quite satisfied that at that 660 yards the air is perfectly good?—Yes, it is at the bottom of our main intake.

16,808. Has it any communication perpendicularly?—No, not at that point.

16,809. Where is the nearest perpendicular communication in this level?—We have no perpendicular communication.

16,810. Have you any level driven alongside of that?—Yes; up to within 30 yards.

16,811. How soon will your furnace be at work?—In the course of a month.

16,812. And then you will brattice it?—Then we shall brattice it if necessary.

16,813. And you would not think that it would then be necessary to have a fan?—We can very soon see.

16,814. Do you take the men out when you find that the candles will not burn?—Yes.

16,815. But the candles now when you pump air will burn perfectly?—Yes, on ordinary days. There are some days when the air is exceedingly slack, and then we take the men out.

16,816. How long in this year have you had to take the men out?—It has only been going three weeks.

16,817. Have you had to take them out during that time?—Merely while we put in the boxes.

16,818. You mean the boxes for the air?—Yes. What I have mentioned is quite an exceptional case; I never met with the gas before, *i.e.*, in these mines, except in small quantities.

16,819. Have you ever been in an iron district before?—I served my apprenticeship to Mr. Marley, who has been examined, and I then had an opportunity of examining Eston regularly.

(E^{1}.) ACCIDENTS.

(E^{1}.) *Accidents.*

(E^{1}.) *Accidents.*

Mr. Allan Backhouse Salmon, Jun.

12,757. (*Chairman.*) Have you had any accidents?—Very few indeed.

12,758 Any within the last three years?—Two fatal accidents I think in that time.

12,759. By what were they occasioned?—By the falling of earth from what we call the fore-breast; the man had struck rather too far in.

12,760. Was the fall from the roof?—Yes, a sort of slopping fall.

Mr. James Dees, C.E.

13,116. (*Mr. Austin Bruce.*) Have any other accidents occurred besides those arising from the blasting with powder?—We have had two or three accidents which arose from the incautiousness of the men getting on to the cage after it had started; they did not get fairly into the inside, and were caught against the framing of another eye above; we have had two accidents of that sort, and accidents from falls. Sometimes when the miners have fired a blast they were not sufficiently careful to take down the ore that had been loosed, and it came down upon them.

Joseph Whitwell Pease, Esq.

16,509. (*Chairman.*) How many men are there in a pair?—Two men; these accidents have been in the proportion of one to 179,301 tons.

16,510. Amongst how many men?—On the average 121 men.

16,553. (*Chairman.*) With regard to accidents happening in the mine, is any provision made for the immediate care of the men?—Yes; we have furnished a small hospital in the village of Marske, to which Lord Zetland subscribes very handsomely, and that is attended by a nurse, whom we got from the infirmary at Newcastle, and she has the common hospital stores by her.

16,554. Have you any means of conveying the men to the hospital in case of accident?—We have procured two of the Government ambulances to be at the mines in readiness.

16,555. Is there any case in the hospital now?—There has not been one for four or five months, I believe.

16,556. (*Mr Austin Bruce.*) Do you take any but cases of broken bones to the hospital?—Yes; cases of broken limbs, or a crushed foot or hand, or anything of that kind, they are taken at once to the hospital. We found that in the cottages the nursing was of so inferior description that we thought many of the men who were lost, were lost from want of proper nursing, soon after the accident.

16,557. You do not send cases of sickness to the hospital?—No. From 2nd July 1858 to 26th September 1862 we have lost eight men; three from the roof falling, and five from their pulling stones over upon themselves; these were all fatal accidents. The number of men employed in those mines is at present 320, and the vend is going at the rate of about 428,000 tons a year.

16,558. Have you any prejudices to overcome in inducing the men to go to the hospital?—None at all; they went, after the first man or two had been in, and found the nurse so efficient that they liked her better than the doctor, and they come to her to get their fingers dressed, or anything of that kind.

16,559. (*Mr. Kendall.*) How many men have you ever known to be in the hospital at the same time?—Two; one with a broken leg, and the other with a crushed foot.

16,560. What amount of accommodation is provided there?—There are five beds. The smart money that we have paid in these mines from 30th June 1858 up to 26th September 1862 has been 241*l.* 15*s.* 8*d.*; and the same rule as to the doctor applies there as it does in the other mines.

16,561. (*Mr. Austin Bruce.*) Was the establishment built as a hospital, or did you simply convert cottages into a hospital?—We built it for a hospital in connexion with some cottages that we were then building.

Mr. John Marley, Eston Mines

16,654. (*Chairman.*) Are the men liable to accident from the falling of the roof or falling of the stone after blasting?—Principally from stone falling after blasting; few from the roof falling.

16,655. Where the men are working?—Yes; it cannot be called the roof exactly, but at the face where the roof is in course of formation.

16,656. What would you call it?—The technical term would be the jud; it is in point of fact the bulk of stone which is partly prepared for coming down, and after the shot is fired a portion perhaps has not come down, and it comes down unawares afterwards; that comes down from the face of the work.

16,657. In the last year how many accidents have you had?—During this year, *i.e.*, 1862, we have only had two fatal accidents, we have been freer this year than we hitherto have been.

16,658. (*Mr. Austin Bruce.*) That is one death for every 300,000 tons of stone raised?—The stone which has been raised during that time is 456,000 tons, and is equal to 228,000 tons.

16,659. (*Chairman.*) It is two deaths out of 618 men underground?—Yes.

16,660. Is there any particular precaution which you adopt?—We have adopted all the precautions I think that we know how to adopt; we have established rules similar to the coal mine inspection rules; we are carrying out all the rules of the coal mine inspection, although we are not under inspection. We can show you the rules which we have established. We have what we term our safety rules and commercial rules; the former are divided into general and special rules. In some half dozen collieries which are under my charge for Messrs. Bolckow and Vaughan, we have adopted all the requirements which the Government inspection of the coal mines requires, and we also have adapted them to our ironstone mines. The only rule to which I think it necessary to call particular attention is as to miners, shifters, and putters. Rule 6 was a rule which we had found to answer very well in our coal mines, and it is to this effect: "That should the working place of any "man or boy become unsafe from any cause he is to discontinue working in it, and immediately to send for the "deputy; but if unsafe from want of timber being set, "then in the absence of the deputy, there being sufficient "timber in the place, the miner is to set it, in order to "prevent any accident, and report the same to the overman or inspector." I have had occasion to vary that rule in one colliery, for which I was consulting engineer, in the same way as we have varied it here. This is the addition to rule 6: "After the word 'inspector,' read and in all

Acci-

"cases, *whether considered dangerous or not*, the miner, "when taking out a leg or using the hack" (that is one of his tools) "underneath stone, to set a punch-prop or "sprag-prop so as to prevent any accident; such props of "suitable lengths will be provided in each working place "ready to be set. My reason for calling attention to that change of rule is this: In the first instance you will see that a man was to do this in case it became unsafe; of course the man was to judge whether it was safe or not, and in many instances, owing to its being more economical for his own pocket or from error of judgment thinking it safe, he did not set those props; and we have had, we may say, the bulk of our accidents originally arising from this cause, namely, that in carrying forward the heading or excavation after the shot had been fired, and a certain part had not come down, instead of setting the sprag-prop, the result was that they did not set these props when left to their own discretion to say whether it was dangerous or not. It was impossible, of course, for an officer to stand over every man, and notwithstanding verbal and positive orders to the contrary, we had three fatal accidents within a fortnight, I believe from that very cause, it being proved to the coroner's satisfaction that orders had been given, and hence you have the change of rule. We had deputations and a threatened strike in consequence of this change of rule, but one of the owners, and myself and the other agents, met the deputations, and we showed to them that we must carry out the matter in that way whether the place was considered dangerous or not. We now enforce that rule.

16,661. These props are not at the men's expense?—No.

16,662. (*Mr. Holland.*) How is the rule enforced?—A breach of that rule would be followed either by dismissal or by a fine, or by being taken before the magistrates.

16,663. Do you find that virtually the rule is obeyed?—I believe that now the rule is virtually obeyed, although two or three men have been fined lately for a breach of that rule. I will now put in the commercial rules, in which all the fines for everything are set forth.

16,664. What are the deputy's duties?—By way of properly illustrating more particularly what they are, I will begin with the getter of the stone, who is called the miner. The deputies are the persons who have to superintend the putting in of the timber and to see that every place is safe. Above those are the back overmen, then the overmen, and then the underviewer: so that the deputies have to set the timber and to see that everything (under the other officers) is safe.

16,665. What proportion do the deputies bear to the number of men employed?—About 1 to 12, it will vary a good deal according to the quantity of pillar working, whether it is a whole mine or a broken mine.

Blast-

(b¹.)—BLASTING.

Mr. JOHN LINDOW, Wood End and Gutterby Mines.

12,929. (*Chairman.*) Can you describe to the Commissioners in what way an accident happens?—Very often after the miners fire a hole the shot does not run, and it happens in taking the stemming out of the hole again; very often they fire a hole in that way upon themselves; they attempt to clear the old hole out rather than put a fresh hole in.

12,930 Do the miners use an iron pricker?—Yes, we have iron prickers; we have had copper ones, but if you give them to the miners they lay them on one side, and they will take up an iron one.

12,931. Do you not think it would be safer to use copper prickers?—Yes, in hard ground; but in wet and softer ground we fire with a fuze.

12,932. You do not use a fuze in all cases?—No.

12,933. By what means do the men fire the shots?—In ordinary holes with straws.

12,934. Do they put a straw into the hole?—Yes, after they have drawn the pricker out.

12,935. Do they use touch-paper?—They use merely touch-paper which they make themselves.

12,936. Do they judge of the time before the explosion will take place by the length of the touch-paper?—Yes, they judge what distance it is, and they have generally but a short distance to go, say 10 or 15 yards, until they get behind a pillar to protect themselves.

12,937. Can you state the reason why the patent fuze is not always used?—No, but it is only used in wet ground. In hard ground, in stemming a hole they frequently get their fuze cut into two, which of course prevents the fuze then running down to the bottom of the hole, and in case they were to bore that out it would be more dangerous for them.

(E b¹.) Blasting.

12,938. You are of opinion that the men prefer the old plan to the patent fuze?—You could not get them to use the fuze in hard ground, where the ground is dry you cannot get them to do it, they would lose so much time.

12,939. In what way would there be a loss of time?—By the cutting of the fuze; and then they would have to open the hole out again, and that would make it more dangerous; they might easily ignite the powder then.

12,940 (*Mr. Holland.*) Do the miners use hard material for stemming?—They use shale, and when that is thumped down by a hammer, it becomes a very solid substance.

12,941. Have the miners any other objection to the patent fuze than that which you have mentioned?—That is the only one; in wet ground it is a great saving.

12,942. Have they any objection to the fuze on account of the smoke?—Not with us; in a badly ventilated place, of course it does cause a little more smoke; but in the places that I allude to they could not work otherwise than with a fuze. I am now speaking of wet ground.

Mr. JAMES DEES, C.E., Parkside Mines.

13,055. (*Chairman.*) I believe you blast the rock?—Yes.

13,056. Have any accidents occurred from blasting?—We have accidents frequently, but they are almost all attributable to the carelessness of the men.

13,057. Do you know how these accidents occur generally?—They frequently occur from the men using an iron rammer, as they call it, instead of a wooden rod, which we provide them with to push the powder in. There are many small cavities in the iron ore, and the iron is very apt to strike fire by hitting the edges of those cavities. When the men seize hold of an iron rod instead of a wooden one to push in the powder it explodes the powder and their faces are injured.

13,058. They require to use an iron rod I suppose for tamping?—Yes.

13,059. What do they put in on the top?—They put in clay, which is found in the mines. There are large cavities, which are filled with very fine clay, that clay is cut into oblong pieces, sent up and dried on the boilers, and when it is dried the men use it for tamping.

13,060. And in that process there is no fear of any explosion?—No, unless the pricker happens to strike fire against the bottom of the hole.

13,061. Is that made of copper or iron?—We use iron; we have tried a copper one, but on account of the great number of small cavities in stemming, from the softness of the copper, it is driven into these cavities in the side, and there is great difficulty in drawing it out. We have therefore been obliged to discontinue it, and we now use iron.

13,062. If any metal harder than copper could be found it might answer the purpose?—Yes; I should rejoice to have anything like bronse, or any other metal that would not bend with the tamping or stemming, and that would not strike fire.

13,063. Do you use the patent fuze in your mines?—No; and for the same reason that we cannot use the copper pricker. When the patent fuze is used it is put in with the powder, and the stemming is driven in round the fuze. We have tried it, and we find that the fuze is driven into those cavities in the same way as the copper rod is, and it breaks, that is, the connection between the firing at the end of the powder is broken off from the irregularity of the bore hole. We use a straw filled with small powder instead of the patent fuze, which is put into the hole left when the pricker is withdrawn.

13,064. Why can the fuze not be used with safety?—Because of the nature of the ore, being so full of cavities, and those cavities having very sharp edges, so that if the safety fuze was used, the act of tamping would force the fuze into those cavities, the sharp edges of which would cut it, and thus render it entirely ineffectual.

13,065. How is the straw filled?—The straw is of the same length of the pricker, and that is filled full of very fine powder; it is split at the end, and a match longer or shorter, according as the safety distance may be from the hole, is lighted, and as soon as the fire reaches the straw the powder in the straw explodes and communicates the fire.

13,066. What is the match made of?—It is made of linen rag, generally speaking; the men will take some tallow from the candle and grease it round, so as to cause it to burn; they light the end of it; and according to the distance they have to go to get to a place of safety, so is the length of the match; it is a sort of wick.

13,067. Do the miners make it themselves on the spot?—Yes.

(E^{1}.) ACCIDENTS.

(Eb^{1}.) *Blasting.*

Joseph Whitwell Pease, Esq.

16,497. (*Chairman.*) Have any accidents occured in your mine from blasting?—Not directly; I think not one. Most of our accidents have been indirectly from blasting, either by the men going in too soon, or else from the roof falling after they have been in. In these mines we have only had, in the course of six years, ending 31st December 1861, (and I have not gone further back) four fatal accidents. One man was killed in 1856 by the fall of stone from the roof; one boy was killed in 1857 from a horse running away; one man was killed in 1858 from the stone falling upon him that he was working under, and one man was killed in 1859 from the roof falling. Since that we have had no fatal accident.

16,567. Have any accidents occurred in the mines from blasting?—No fatal accidents from blasting.

(Ec^{1}.) *Falling away from the Ladders.*

(c^{1}.)—FALLING AWAY FROM THE LADDERS.

Mr. John Lindow, Wood and Gutterhy Mines.

12,858. (*Chairman.*) Of what description were the accidents that occured; did the men fall off from the ladders when they were in use?—We have had one or two men with broken legs which occurred from the use of the ladders?—In case three or four men were going down the ladders and the top man lost his footing, he would take all the remaining party below him down with him.

Ed^{1}.) *Fall of* *Rock.*

(d^{1}.)—FALL OF THE ROCK.

Mr. Robert Kendall, Lindale Moor Mine.

12,256. (*Chairman.*) You have a great many shafts?—Yes; our ground is very treacherous. We have a dirty clay which squeezes, and our shafts do not last very long

12,257. The shafts collapse?—Yes; we have very poor ground to work in. It is generally a swelling tough clay.

Henry William Schneider, Esq.

12,386. (*Chairman.*) To what description of accident should you say that men are liable, any particular description of accident?—The accident to which the men are most exposed is from rocks of ore dropping either from the end or top of the levels while they are in the act of either timbering or preparing the timber.

Joseph Whitwell Pease, Esq.

16,498. (*Chairman.*) I suppose that the greatest risk to which the men are liable is the falling of the stone from the face?—Yes; and in my opinion it is generally from their own carelessness and anxiety to get quantity.

16,531. Is the mode of working the mine different from the other?—There is no difference in the mode of working, but the height of the stone has made it rather more dangerous on account of the men having a greater temptation to work under the stone, and to bring large quantities over

15,532. Do you leave a certain proportion of the stone to serve as a roof?—Yes, a small portion of the stone is left as a roof.

(h^{1}). TIMBER WORK IN MINES.

(E^{1}.) *Timber Work in Mines.*

Henry William Schneider, Esq.

12,387. (*Chairman.*) But when once the ground is timbered up it is safe?—Yes; we never have known an instance of any level suddenly giving way, although the crush upon the levels is enormous, so much so that a stick of timber nine inches in diameter has been known to be crushed in 24 hours; still it is gradual and it never entirely closes up the level.

Joseph Whitwell Pease, Esq.

16,499. (*Chairman.*) Do you use timber in the mines?—Yes.

16,500. Is that timber supplied to the men, and do they put it up?—No; we have men whom we term deputies, whose care it is to see that the men are properly supplied with timber, and that the mines are properly protected with it.

16,501. That is their special business, is it?—Yes, that and the laying down the ways to the men who are working.

16,502. Is it their business to see where the timber is required?—Yes, and if any man calls their attention to his place it is their duty at once to go to it. At the time of the last accident from the roof falling the deputy had just put up a prop behind a man, and the roof fell within I believe, two feet of the end of his place of working.

(j^{1}.)—COPPER PRICKER AND TAMPING BAR.

(Ej^{1}.) *Copper Pricker and Tamping Bar.*

Mr James Dees, C.E., Parkside Mines.

13,060. (*Chairman.*) And in that process there is no fear of any explosion?—No, unless the pricker happens to strike fire against the bottom of the hole.

13,061. Is that made of copper or iron?—We use iron, we have tried a copper one, but on account of the great number of small cavities in stemming, from the softness of the copper, it is driven into these cavities in the side, and there is great difficulty in drawing it out. We have therefore been obliged to discontinue it, and we now use iron.

13,062. If any metal harder than copper could be found it might answer the purpose?—Yes; I should rejoice to have anything like bronze, or any other metal that would not bend with the tamping or stemming, and that would not strike fire.

Thomas Ainsworth, Esq., Cleator Iron Ore Mines.

13,158. (*Chairman.*) Do you supply them with with pointed copper stemmers?—No.

13,159. We have been told that the copper pricker, owing to the nature of the cavities in the ore and the edges being sharp, does not answer?—A copper pricker is very liable to be bent and to be twisted, and perhaps worn away; but if the men would be more careful, if they would not wish to do ten minutes work in five minutes, and would take a little more time, I do not think that that would happen.

13.160. But the copper being a softer material than the iron gets bent?—Yes.

F^{1}.) *Changing Houses.*

(F^{1}.) CHANGING HOUSES.

(F^{1}.) *Changing Houses.*

Thomas Roper, Esq.

12,193. (*Chairman.*) Is there any place for them to change in, called a changing house?—Every pit has a boiler, and the men are allowed to change in the boiler-house; these is no place built on purpose.

Mr. Stephen Jackson, Lindale, Cote, and Ure Mines.

12,596. (*Chairman.*) Where do those who change their clothes change them?—We have a changing house.

12,597. Are there any means of drying the clothes?—The clothes are always dried in the engine house.

12,598. But there is another room for them to dress in?—Yes, but they very seldom use it; unless you forced them there they would go to the engine-house.

Joseph Rawlinson, Esq.

12,809. (*Chairman.*) Do they change their clothes when they go down to work?—They change their working dresses, but they do so at home; they do not change at the mines. Our men do not; I believe that some do. I believe that some of Mr. Schneider's men do. The dwellings of our men are not far away from the mines, and they go in their working clothes from their own houses.

(G^{1}.) *Wages and Deductions.*

(G^{1}.) WAGES AND DEDUCTIONS.

(G^{1}.) *Wages and Deductions.*

Thomas Roper, Esq.

12,172. (*Chairman.*) What are the deductions which are made in the gross payment of the men?—In our own mines we have 3*d*. per week from each man, which goes to the maintenance of a doctor to attend all their cases, and to the education of all the children. Besides that fund of 3*d*. per week there are subscriptions which each partner individually in our concern makes, and the neighbouring mine owners whose children are likely to come to our school, also assist in maintaing the school.

12,179. How are the men paid; are they paid in notes, or in gold, or in silver?—We pay fortnightly; each man will not earn more than 2*l.*; he is paid in gold and silver.

Mr. Robert Kendall, Lindale Moor Mine.

12,283. (*Chairman.*) What allowance of candles do they get?—We find candles for them, and we allow them 2 lbs. a week, which is quite sufficient, and if it be very good air weather they will save one or two, and if it be bad air weather, so that the candles get soft and burn quicker, they have to find one or two themselves, and a very strong current will burn the candles faster; but we can regulate that by putting on doors so as to stop the ventilation.

12,285. What do they pay for the candles?—We do not charge them for candles; we find candles and tools for them; we give them sufficient candles to supply them, and if they be extravagant they have to make them up, and if they can spare one or two they can take them home.

12,326. Is something deducted from the wages of the men for the maintenance of the school, whether they have children or not?—Yes, we charge 3*d.* a week for school and doctor

12,332. With regard to the relief fund, how much a week do the men pay?—3*d.* a week.

12,333. That is for school and doctor?—Yes

12,334. Is it for accident and illness; whatever is the illness, are they attended by the doctor?—Yes.

12,335. What allowance have they when they are ill?—It is not a rule that we have to give them any allowance, but if we have any surplus money we give them something out of the school and doctor fund; and if a man gets fined, which is very rare, but which sometimes happens, that money goes to the school and doctor fund. In some cases a man may leave his work for a day or two, and then what he forfeits goes to the school and doctor fund.

12,336. A separate account is kept of this fund?—Yes, it is a separate fund altogether.

12,337. Are the receipts from the men sufficient to support it?—No, it seldom pays for itself except in some cases with these fines being put to it, but whatever falls short Harrison Ainslie and Company make it up.

12,338. Does the doctor attend the men's families?—No, he does not attend, but if any of the family will go to his surgery, he will give them advice and medicine free. He will attend men, but only men; but if he was passing through a village where they lived, he would call in if they asked him.

Henry William Schneider, Esq.

12,391. (*Chairman.*) How often are the men paid?—We pay once a month.

12,392. (*Mr. Austin Bruce.*) Are there any intermediate draws?—They are allowed to draw whenever they like. If any man wants a draw, he has it; but the system with us is so well understood that the men very seldom require a draw. They can always procure during the month everything that they wish to have; there is no difficulty at all. I should mention in reference to that that if we had experienced any difficulty whatever we should instantly have altered our system and made the pay once a fortnight; but inasmuch as we have so many pays, including the iron furnaces, it is inconvenient to pay oftener than once a week, and therefore the pays are distributed every Friday, so as to bring in a certain class of men once every week. The men at the furnaces are paid once a fortnight. I wish to mention one thing in connexion with that subject, namely, that for some years we had Saturday as the pay day, but we found that the men coming to be paid on the Saturday afternoon in their clean clothes went immediately to the public houses from the pay office in the town and got drunk, and remained drunk during the Sunday. After reflection it was determined that we would pay them on the Friday afternoon as they left work in their dirty clothes, and we have found that is has operated in a very marvellous manner in checking drunkenness, because the men are now disposed to go home at once, and they get their money taken possession of by their families intead of going to the public house to drink it.

12,393. (*Chairman.*) Do the men come back to work on the Saturday always?—I accompanied that with another rule, which was this. Feeling thoroughly satisfied that I could depend upon my men not leaving me for the penalty which I had determined to inflict upon them, I established a rule that any man who was absent from work either on the Saturday or the Monday after the pay day should be allowed to play for a week,—he was not allowed to come to work for the remainder of that week; in other words, we inflicted the penalty upon him of the loss of the week's wages.

12,394. And you found it answer?—Yes.

12,395. (*Mr. Holland.*) Very few incurred the penalty?—None When I say none, one perhaps in 450.

12,396. (*Mr. Austin Bruce.*) Then, in fact, there is no more drunkenness after pay day than there is at any other time?—Just so.

12,397. (*Mr. Holland.*) Was that change effected without any grumbling on the part of the men, or with very little grumbling?—I never heard anything of it. I believe that one or two did grumble a little. When I first established the Friday's pay the men were disposed to be absent on the Saturday entirely, and under the then rules they were fined half-a-crown for being absent from their day's work. I made a calculation by which I found that the loss by a man of his day's work, paying his fine of 2*s.* 6*d.*, and losing what he would earn during the time, and the money he spent came, to an average of about 10*s.*; I then found that that 10*s.*, divided over the whole of the ore which we raised, came to something like a penny upon what we call our pit tons (which is not an imperial ton); I immediately determined that I would knock of a penny from the wages, and I put it to the men that as they could afford to be absent in this way from drunkenness and to lose 10*s.*, by taking a penny away from them, if they worked during that time they would just get such an increased quantity of ore as would give them exactly the same wages by working continuously as they had done previously, and that, therefore, they would be in exactly the same position but without having the opportunity of spending their 10*s.* in drunkenness. I therefore determined to take this penny off from the whole of the mine, the effect of which was that I made the steady men so excessively angry with those who had brought the penalty upon them, that I created a moral influence and established a very wholesome system, which enabled me afterwards to carry out the other system which I have mentioned, of letting them stop away for a week, and I also succeeded at the same time in producing an economy in the working of the mine

12,398. You turned the good men upon your side?—I turned the good men upon my side. I had the curiosity to take out very carefully the men's wages prior to that reduction of a penny, and subsequently to that reduction of a penny, and in the following two months they actually earned a shade more on the average than they had done before the penny was knocked off them

12,401. Is there any demand for education?—The system of education in this country has been excessively bad in this parish, in consequence of their being under the influence of an endowed school, which practically afforded no education and stopped all efforts which were made to get education established upon a proper principle; but under the new law which was passed a short time back we have been enabled to get the old trust put an end to, and we have now succeeded in getting schools built in the parish of Dalton at a cost of about 2,000*l.*, which will accommodate about 500 children. Those schools are now on the point of being opened, and we shall commence with their opening a system of charging every man 6*d.* a month, whether he has children or not, and undertaking to educate the whole of the children which those men may have, whatever their number may be

12,402. (*Mr. Holland.*) Do the men who have no children complain of that?—Not at all. I may say that in future the facilities for education in the parish will be as great, I think, as any parish in England; there will be accommodation for 1,200 children in the parish.

Mr. Richard Hosking, Parks Mousell Mines, &c.

12,532. (*Mr. Holland.*) Are not the wages better here than in Cornwall?—I think they are.

Mr. Stephen Jackson, Lindale, Cote, and Eure Mines.

12,589. (*Chairman.*) What are the deductions from the men?—We have no deductions from the wages of the men excepting for candles.

12,592. How often do you pay them?—Every four weeks.

12,640. (*Mr. Kendall.*) Do the men ever make money and go into trade?—I do not believe that they do; not one of them has ever saved money that I know of. They get more than 1*l.* a week on the average.

12,661. (*Mr. Holland.*) Then their real wages are more than you say; their is their profit upon that garden; it saves money?—Yes. An underground man on an average will get a guinea week, and some more.

12,652. They are constantly employed the whole year round, are they not?—Yes.

12,653 Do agricultural labourers get constant employment the whole year at that rate?—No. What you would call occasional farm labourers are, I know, very subject to be thrown out many months in the winter.

12,654. In that case the miners' wages are very much higher than the agricultural labourers' wages?—Yes.

Edward Wadham, Esq.

12,690. (*Chairman.*) In the mines with which you are connected is there any uniform system of payment as to the days on which the men are paid?—They are paid once a month in some of the mines, and once a fortnight in the others.

12,692. On what days of the week are they paid generally?—On the Saturdays.

12,693. Some mines are paid on the Fridays?—Yes; Mr. Schneider's mines are paid on the Fridays, but the others are all paid on the Saturdays.

12,694. Do you observe any difference in the conduct of the men of those mines which are paid on Fridays, and those which are paid on Saturdays?—No; I think no material difference.

12,695. Do the men get advances during the week if they require them?—They do. On every Friday or Saturday they can obtain an advance.

12,696. Is it given by an order to get provisions?—In some cases in cash, and in some cases by an order to get provisions; it is at their own option entirely; I do not think that in any one instance in the whole district we have a shop connected with the mine.

12,697. But there are shops where an order from a mine would be attended to?—Yes.

12,732. (*Mr. Davey.*) You say that all your mines are paid on a Saturday?—Yes, with the exception of Mr. Schneider's.

12,733. Are the man paid at the mine in their working clothes?—Yes.

12,734. Do they come regularly again to work on the Monday morning?—We miss a few; but as a rule they come very regularly. I think that the behaviour of the men has been very much improved in the last four or five years; we have not so much drunkenness. There has been great provision made by schools and clergymen, and also the tenants themselves have set on fines for men who do not appear on the Monday morning, and that has a great effect in checking the drunkenness.

Mr. Allan Backhouse Salmon, Junr.

12,741. (*Chairman.*) How much?—The men are charged 8*d*, but then it is made up in the price which is given for fathom or tonnage work.

Mr. John Linnow, Woodend and Gutterby Mines.

12,868. (*Chairman*) How many men are there in a party?—That depends upon the width of the working and upon the hardness of the ground; some portions of the ore are much harder and much more difficult to penetrate with the jumpers than others, and when we find that that is the case, if we were to put a number of men in we should find the profits so much less; the men will have wages, they earn as much as 4*s*. a-day, and many others earn much more; the best men have the privilege of making as much as they can.

12,876. Are the lowest earnings 4*s*. a-day?—That depends entirely upon the kind of man, whether he is an energetic, clever man or not; some men will make 7*s*. a-day, and if so, we are proud to pay that amount to skilful men, but some are making less than that, from 22*s*. to 24*s*. per week; and referring to those men who work underground as competent miners, you may take the average at 24*s*., taking the whole of our miners together.

12,900. How often are the men paid?—Once a fortnight.

12,909. Are there any deductions besides powder and candles?—No, those are all with us.

12,912. So that no deduction is made for candles if a man brings his own?—No.

12,913. Is your practice the same with regard to powder?—Yes.

12,957. (*Mr. Kendall.*) Do you think that the average wages of the miner in this neighbourhood is 24*s*. per week?—No.

12,958. What do you think is a fair average to take of the wages in the neighbourhood?—I cannot say; they vary much in different pits; and there is a certain class of men who are not worth 24*s*. a week.

12,959. Do you think that the wages average 20*s*. a week, taking one pit with another?—I do not think they do.

12,960 Do you think they average as much as 18*s*.?—We give to the very poorest men that we have 18*s*. a week.

12,976. How do you manage to pay him up on the Saturday, do you pay up close, or measure up close?—A man has finished his work by two or three o'clock.

12,977. Do you measure his work close up to his heels?—Yes, for the last bogie that comes out is weighed, and he is paid for it in a few minutes.

Mr. James Dees, C.E., Parkside Mines.

13,083. (*Chairman.*) Are the miners paid once a fortnight?—Yes.

13,084. Is it your practice to keep back a week's legging, as it is called?—No, our books are made up to the Wednesday night, and the men are paid on the Saturday following.

13,097. Will you have the goodness to state the highest and the lowest wages which the miners earn?—There are some of our men who get upwards of 30*s* a week, and others of them do not get more than from 16*s*. to 18*s*. a week, but then that varies. Perhaps there is one man who is getting 18*s*. for one fortnight, and in the next fortnight, if the place gets better to work, he may get as much as 25*s*. I think that the average is about 22*s*.

13,102. What deductions are made besides for powder and candles, and the club, or are there any?—Yes they pay for sharpening their tools.

13,103 Is the wear and tear of the tools taken into account, and are they weighed?—No; when they first begin to work the place they have a set of tools given to them; the most expensive of them are the drills, which are made of cast steel, and before the miners can get a new one they must bring the short one in; but there is no deduction made for wear and tear; if they lose one they must pay for it.

Thomas Ainsworth, Esq, Cleator Iron Ore Mines

13,138. (*Chairman.*) Do you know what deductions there are from the price which you pay the men per ton?—They pay for their own powder and candles, and sharpening and shafting gear.

Joseph Whitwell Pease, Esq.

16,503, (*Chairman.*) How are the bargains made with the men, by the ton?—Yes, and we pay them for the actual work that they get out We weigh every tub that comes out, and pay the men a price per ton according to the weight of the tub that he sends out.

16,504. How often are these bargains made?—All our men are under fortnightly biring, and these are the conditions of the hiring (*handing in the same*).

16,568. The stone does not give out fire?—No, not even in drilling. The net wages at these mines were 3*s*. 9*d*. for the half year ending 30th June 1861; 4*s*. 1½*d*. for the half year ending 31st December 1861; and 3*s*. 11*d*. for the half year ending 30th June 1862; they run very much the same.

Mr. John Marley, Eston Mines.

16,644. (*Chairman.*) How often are the men paid?—Once a fortnight.

16,645. On what day in the week are they paid?—On the Saturday, and they are paid up to the Saturday previous; their balance is struck and everything is included up to the Saturday; the bills are made out, and it takes between the two times for the passing of the accounts, checking them, and so on. Each individual man is paid his own money; if they are working in pairs, there must be an authority or an understanding who is to draw the money.

16,646. What are the wages?—From December 1861 to June 1862 the gross earning upon the average of every man were 5*s*. 2*d*. per day, less powder and candles, reducing it to 4*s*. 4½*d*., they paying for the houses and fuel themselves.

16,650. With regard to their tools, are they supplied, or do they supply themselves?—The tools are entirely found by the owners.

16,651. And do the men not pay anything for wear and and tear?—No; if they lose them or damage them through carelessness they pay, but they pay nothing for the use of them if they have used them properly.

(G^1.) WAGES AND DEDUCTIONS.

Mr. Addison L. Steavenson, Normanby and Skelton Mines.

16,758. (*Chairman.*) Are they supplied with tools, or have they their own?—We supply the tools.

16,759. Do they pay for the wear and tear of tools?—No, they give them in when they leave; if they lose any they pay for them.

16,760. Do you pay every fortnight?—Yes.

(d^1.)—MONTH IN HAND.

(Gd^1.) *Month in hand.*

Mr. Robert Kendall, Lindale Moor Mine.

12,289. (*Chairman.*) Do you give an order for any of the wives to get provisions?—Yes; we give them subsist every week, so that they can get provisions at a store, and in some cases when it is actually needed we give money.

Mr. Stephen Jackson, Lindale, Cote, and Ure Mines.

12,593. (*Chairman.*) Are they paid up fully, or is there an arrear?—There is the in-legging week.

Edward Wadham, Esq.

12,691. (*Chairman.*) What is the length of time for which the money is retained in hand?—Universally a week.

Mr. Allan Backhouse Salmon, Junior.

12,745 (*Chairman.*) When are the men paid?—Every four weeks.

12,746. Is a week retained?—The in-legging-week is kept back.

12,747. On what day in the week are they paid?—On the Saturday, at about two o'clock in the afternoon.

Mr. John Lindow, Wood End and Gutterby Mines.

12,901. (*Chairman.*) Do you keep anything in hand, or is there what is called a week's in-legging kept in hand?—We do not do that. We pay them up to the last moment; the men come from the works to the pay place and receive their money at 3 o'clock in the afternoon.

Joseph Whitwell Pease, Esq.

16,505. (*Chairman.*) How often are the men paid?—They are paid fortnightly up to the end of the previous week.

16,506 Then there will be one week in arrear?—Yes; we pay on Friday up to the previous Saturday.

16,507. Do you find that that mode of paying on Fridays is attended with advantage?—At the Hutton mines we adopted the practice of paying on Friday in order to give the men an opportunity of attending Guisborough market on the Saturday.

16,508. With how many men is a bargain made?—It is made with every man individually, but they generally work in pairs.

(f^1.) PAYING IN NOTES.

(G^f.) *Paying in Notes.*

Mr. John Landow, Wood End and Gutterby Mines.

12,978. (*Mr. Kendall.*) In what shape do you pay the men, in notes or in gold?—In gold and silver.

Mr. James Dees, C.E., Parkside Mines.

13,085. (*Chairman.*) Are the men paid in gold or in silver?—They are paid in gold, silver, and copper; we never by any chance pay them in notes.

(j^1.) BARGAINS.

(Gj^1.) *Bargains.*

Mr. John Marley, Eston Mines.

16,641. (*Chairman.*) How are the bargains made with the men?—Bargains are not required to be made at all often with the men; for instance, the same ton prices have been going on for four or five years, and unless there is some very extraordinary demand for men, or some very great depression of trade, those prices continue; they are all by the ton, except in the Fore Winning, where the places are narrow and require to be driven of a less size than usual, in which, as well as the ton price, they have a price per yard. All those prices are fixed prices, so that a man knows what the price is, and every man is paid his own price.

16,642. (*Mr. Austin Bruce.*) When was your last reduction in wages?—In 1857.

16,643. And the price has been the same ever since?—There have been slight variations in prices since 1857, but no general alteration; what there has been has been a tendency upwards.

(I^1.) CANDLES.

(I^1.) *Candles*

Mr. Stephen Jackson, Lindale, Cote, and Ure Mines.

12,578. (*Chairman.*) What do they pay for them?—They pay 7*d.* a pound for them.

12,579. Do you allow them any special quantity?—They have as many as they require.

12,580. Do they use them at their own houses?—I think not; I have never known an instance where they have done so.

12,581. But if they paid for them, would you find fault with it?—We should. We do not wish them to be used for any other purpose than our own.

12,582. But you do not limit the quantity?—No, we pretty generally know what a set of men should want in candles during the week.

12,583. But you would give them more if they wanted it?—We should not hesitate to give them a pound or two extra, if the men could assign any reason.

12,584. On working in a party, how much a week is used?—They use about a pound a day, about 7 lb. in a week, that is for one set of men.

12,585. How many men?—Generally about two men.

Joseph Rawlinson, Esq.

12,791. (*Chairman.*) What deductions are made from the men for candles?—We charge our men with the candles. They take the ore, or the working of the mine, so much per fathom, or so much per ton, and we just charge them the cost price of the candles.

12,792. Do you limit the quantity which they are to get?—Not at all, they are as careful as possible, because they have to pay for the candles.

19,793. They are not likely to dispose of them?—No, I am sure that they will not do so.

Mr. James Dees, C.E., Parkside Mines.

13,098. (*Chairman.*) What deduction is made from that for candles?—I think that the price for candles is 7*d.* a pound.

13,104 Have the candles which a miners use a cotto wick?—Yes.

13,105. If a candle with a cotton wick goes out, is there not some difficulty in blowing it in again?—I never heard of any difficulty.

13,106. I suppose they all use candles with cotton wicks? Yes, so far as I am aware.

13,107. Have you never seen a candle with a mixed wick in use?—No, I have not.

Thomas Ainsworth, Esq., Cleator Iron Ore Mines.

13,144, (*Chairman.*) What price do the men pay for candles?—They pay the price which we contract for. We make a large contract, and they get them at the same price.

Mr. Archibald Bell, Cleator Iron Ore Mines.

13,184. (*Chairman.*) Do you make any particular allowance of candles?—No, we leave them to purchase their candles; we supply them at them at the works.

13,185. But they are not obliged to take them from you?—No; we are often out of candles, and the people may go where they will for candles.

Joseph Whitwell Pease, Esq.

16,514. (*Chairman.*) What deductions are made from the earnings of the men for candles?—The miners pay for their candles and for their powder; we supply a few of the candles, but not many; they buy them principally at the shops, but we supply the whole of the powder, and the net earnings of the men, after these deductions had been made, averaged in the half-year ending 30th June 1861, 4*s.* 4*d.* a man per day; in the half-year ending December 1861, 4*s.* 2*d.* per man per day; and in the half-year anding 30th June 1862, 4*s.* 3½*d.* per man per day.

Mr. John Marley, Eston Mines.

16,647. (*Chairman.*) What is the case with regard to the supply of candles?—A man gets them where he likes; of

(I^1.) CANDLES.

(I^1.) *Candles.*

course we know that he must pay for them, and we put down the sum of 2*d*. per day as an approximate cost.

16,648. He does not necessarily get them from you?—We do not supply them at all.

Mr. Addison L. Steavenson, Normanby and Skelton Mines.

16,756. (*Chairman.*) Do the men purchase their candles and powder from you?—They purchase the powder.

16,757. Not the candles?—No.

(J^1.) POWDER.

(J^1.) *Powder.*

Thomas Ainsworth, Esq., Cleator Iron Ore Mines.

13,144. (*Chairman.*) What price do the men pay for candles?—They pay the price which we contract for. We make a large contract, and they get them at the same price.

13,145 And the same with powder?—And the same with powder.

Mr. Archibald Bell, Cleator Iron Ore Mines.

13,186. (*Chairman.*) It is the same with the powder?—Yes, we supply it. It is the wish of the miners for the company to provide these things for them, and when it is a wish of theirs of course we let them have them from us.

Mr. John Marley, Eston Mines.

16,649. (*Chairman.*) Do you supply power?—When the Eston Works commenced consuming about a ton of powder a week, we found it impossible for the small shopkeepers to comply with the Act of Parliament, so that we have a powder magazine, not directly in connexion with the mines, a powder magazine where the men can get supplied; but they can get the powder where they like.

(K^1.) CLUBS.

(K^1.) *Clubs.*

Mr. Stephen Jackson, Lindale, Cote, and Ure Mines

12.586, (*Chairman.*) Do the men pay anything to the sick club?—No, we have no sick club.

Mr. Allan Backhouse Salmon, Junr.

12,751. (*Chairman.*) Do they pay towards a club?—We have a sick club.

12,752. What do they pay to the sick club?—1*s*. 6*d*. a month; 4½*d* a week.

12,753. Does that include sickness and accidents?—Sickness, and in case of death a payment at death.

Mr. John Lindow, Wood End and Gutterby Mines.

12,922. (*Mr. Holland.*) I suppose there has not been any very large deficiency?—No, if the club is well managed there is not.

Mr. James Dees, C.E., Parkside Mines.

13,076. (*Chairman.*) Is there any club connected with the mines?—Yes, we have a sick fund and combined with that is a relief fund.

13,077. What do the men contribute?—The men pay 6*d*. a fortnight; and for that we find them medical attendance, both for themselves and their families; for the first six months they receive 8*s*., a week, and then there is a reducing scale from 8*s*. to 6*s*., and from 6*s*. to 4*s*. If they are a long time on the sick fund I think the least they get is 4*s*. per week. We pay them every two weeks.

13,078. Is a separate account kept of this fund?—Yes.

13,079. Is the amount contributed by the men sufficient to provide them with these allowances when they require them?—Yes; what the men pay is sufficient, but I will explain that. The banksmen or the pit-top-men, originally received 6*d*. per man for getting out the clay, drying it, and preparing it for the stemming; some time ago I thought that 6*d*. was too much for those men; 6*d*. is still taken for it, but one half of that sum only is given to the men who prepare the stemming, the other half goes to the sick fund, therefore the men really only pay 3*d*. a week for the sick fund.

Thomas Ainsworth, Esq., Cleator Iron Ore Mines.

13,142. (*Chairman.*) So that there is now no allowance for a sick man, but the doctor attends him?—Just so.

Mr. John Marley, Eston Mines.

16,720. (*Chairman.*) Are there any clubs connected with your mine?—There is a provident fund, to which all the fines from the men go.

16,721. Do the men subscribe to that provident fund?—They do.

16,722. What amount per week?—4*d*. a man, and 2*d*. a boy.

16,723. Are they all obliged to subscribe?—Yes; unless they have previously provided for themselves by joining two duly authorized benevolent societies.

17,764. Is it for sickness?—For sickness, accident, and death.

12,725. Are the families attended?—Yes, the wives and children.

Mr. Addison L. Steavenson, Normanby and Skelton Mines.

16,751. (*Chairman.*) Have you any fund in case of sickness connected with the mine?—No.

16,752. Or accident?—No.

16,755. But there is no club?—There is no club.

(L^1.) DOCTOR.

(L^1.) *Doctor.*

Thomas Roper, Esq.

12,173. (*Chairman.*) Does the 3*d*. include the attendance of the doctor on the family as well as on the men?—We pay 95*l*. a year to the surgeon, and he has to attend all the miners whenever called upon, and if he is calling at a mining village, and any of the women or children belonging to any of our miners want advice or medicine he gives it, but he is not called upon to go to them specially.

12,174. (*Mr. Austin Bruce*) Does he provide medicine out of the 95*l*.?—Yes.

Henry William Schneider, Esq.

12,399. (*Chairman*) Is there a doctor specially attached to the mine?—Only for accidents.

12,400. Is there any club?—The system with which we commenced our mines was this:—It was a rule of mine that every man should contribute 1*s*. 6*d*. a month towards a club, and we took upon ourselves the responsibility of guaranteeing that that money should be sufficient for its objects, which are, to give every man 10*s*. a week when he is absent from the mine in consequence of either sickness or accident, and, in proportion to the severity of the cases where any accident may result in death, either a pension to the widow and children of 2*s*. 6*d*. to the woman, and 1*s*. 6*d*. to each of the children, or a lump sum, which would vary according to the circumstances and number of children, of from 20*l*. to 25*l*. given to the widow, so that in the event of her being a stranger, she might return to her own part of the country, or if she was a native, to establish her in some small business. We have found that answer very satisfactorily; so much so that we have hardly ever had a case in which the widow has been compelled to apply to the guardians for relief, excepting for a very temporary period; they have succeeded in getting established in some small business. Then I should mention that the reason why we have not a doctor for sickness attached to the club is this, that most of our men belong also to the Odd Fellows Club in the district, and inasmuch as that club provides them with a doctor, if we proposed to provide them with a doctor too, we should have to pay them less sick pay, and they

Doctor.

(L¹.) DOCTOR.

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would then be found with two doctors, which, of course is not required; therefore the men themselves prefer their having the 10*s*. to being found with a doctor and 9*s*. only.

Mr. Stephen Jackson, Lindale, Cote, and Ure Mines.

12,587. (*Chairman.*) Are there any deductions for a doctor?—No, none at all.

Mr. John Lindow, Wood End and Gutterby Mines.

12,915. (*Chairman.*) Is there any doctor's club or sick club in your mines?—There is a doctor's club if the men choose to be in it; and if so they pay twopence per week; but it is not compulsory. Many of them have doctors of their own, and, of course, in that case they are not in the club.

Thomas Ainsworth, Esq., Cleator Iron Ore Mines.

13,139. (*Chairman.*) Do they pay to any sick club?—They have a doctor's club; they stop so much out of their wages in the office, and this is paid over to a doctor who attends them, who is settled in the parish.

Joseph Whitwell Pease, Esq.

16,513. (*Chairman.*) In case of accidents have you made some provision for the man?—Not on these mines; we are here within a short distance comparatively of the houses occupied by the men; we have no hospital on these mines, nor do we make any further provision than this; we pay a doctor 25*l*. a year, and the married men pay 6*d*. a week, the single men 3*d*. a fortnight, which includes medical attendance on their families. To that subscription we add 25*l*. a year, and we also pay 5*s*. a week smart money, as it is called, for men who are out of work from small accidents or from ill health.

Mr. John Marley, Eston Mines.

16,726. (*Chairman.*) Is there a doctor?—Yes; 2*d*. a week for a man, and 1*d*. a week for a boy is charged for the doctor besides.

16,727. Is a separate account kept of the doctor's fund?—Yes.

16,728. And of the other fund?—Yes.

16,729. Is the money which is received from the men and from the fines sufficient to meet all charges?—It has been so far.

16,730. Have the men an opportunity of examining the account?—Yes; there are officers appointed by the men at a public meeting once a year.

Mr. Addison L. Steavenson, Normanby and Skelton Mines.

16,753. (*Chairman.*) Have you any doctor especially appointed?—We have a special doctor, whom we pay.

16,754. Do the men pay?—The men pay 3*d*. a week to the doctor. This is for general medical attendance.

(*a*¹¹.) APPOINTMENT OF DOCTORS.

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Thomas Ainsworth, Esq., Cleator Iron Ore Company.

13,147. (*Chairman.*) By whom is the doctor appointed? By the men. I have nothing to do with it.

llings.

(M¹.) DWELLINGS.

Mr. John Lindow, Wood End and Gutterby Mines.

12,947. (*Chairman.*) What rent are the men charged for the cottages?—The highest price that we charge for a cottage is 2*s*., but in many cases the charge is 1*s*. 8*d*.

12,950. What is the cost of the cottages to you?—I believe that the last that we built and those that we are now building will cost us about 65*l*. each.

12,951. Each containing four rooms and every accommodation?—Every accommodation that I have already spoken of.

Joseph Whitwell Pease, Esq.

16,522. (*Chairman.*) Should you say that there is a want of accommodation for the men in the way of dwellings?—At present in Guisborough there is a surplus of houses; the place is rather over-built.

16,562. (*Chairman.*) How are the men provided with dwellings in the neighbourhood of that mine?—Some of them hire, and others live in our own houses. I think that all the men have gardens of about 22 yards square; the men who are living in our houses have their houses and coals for 4*s*. a week; the coals, we consider, cost from 1*s*. 3*d*. to 1*s*. 6*d*. a week.

16,563. (*Mr. Kendall.*) How many rooms do the houses consist of?—Two rooms upstairs and two rooms downstairs; and connected with the house there is a pantry and small offices, besides a coalhouse.

16,564. Do you know what the height of the bedrooms is?—Eight feet to the eaves, and about a foot or a foot and a half out of the roof.

16,565. What is the size of the rooms?—The size is 14 by 16, and 14 by 10.

16,566. Would it be desirable do you think to have a third bedroom?—There being two rooms downstairs they sleep in one of the downstairs rooms, which is equivalent to a third room.

(*a*¹). SANITARY REGULATIONS.

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Mr. John Bateman Wilson.

13,233. (*Chairman.*) In this neighbourhood, should you say that there is any endemic disease?—No; we are particularly clear of that, but I am afraid that in the course of a few years we shall be subject to it, because there is such inattention to sanitary regulations in the building of new residences. They are nearly all new residences which have been built for the miners, which is quite a new feature in this small locality. There are thousands where there were only dozens before, and there has been so little attention to sanitary regulations, that I am afraid that as we find a kind of cycle of these complaints, in the course of time some of the places will have some very sad outbreaks of cholera and fever.

13,234. Would that be from overcrowding or the ill-construction of the dwellings?—The ill-construction of the dwellings and the want of drainage in front of the dwellings.

13,235. There is no provision for getting rid of the refuse thrown out from the house?—Not any provision, in fact, that seems to be a very great want here, and it will at some time be very serious.

13,236. Is there no sanitary board?—The sanitary board at present is a very inefficient one, it is under the surveyor of highways, and partly the guardians of a country district. These persons do not expend money very willingly; I have experience in that way, because I am a guardian of this union, and have always taken an interest in sanitary matters, and should have liked to have seen these matters carried out, but I find that the law is insufficient.

13,237. Have you represented this?—I have not had occasion lately to do it, but I have done so more particularly as a guardian, not on account of these mines, but in the same locality, when an old Act was enforced, when it was more under the Board of Guardians. Now there is some difficulty in carrying it out.

(*d*¹). POSSESSING FREEHOLDS OR RENTING FARMS.

(M *d*¹.) *Possessing Freeholds or renting Farms.*

Mr. John Lindow, Wood End and Gutterby Mines.

12,965. (*Mr. Kendall.*) As a body do the miners drink much?—I believe they do. I believe they live up to the whole of their earnings generally speaking; but in certain districts, I am proud to say, that we have many teetotallers, and not one drunkard. We have no fewer than 200 men possessing freeholds which they have obtained from their savings. But I am speaking now of our own mines; I have nothing to do with the adjoining mines.

12,966. Referring to the man who have worked for the last 20 years in your own mines, you think that as a body they have been more saving than the miners generally are?—Yes.

12,967. And among them you can reckon many freeholders?—Yes, there is a great number.

12,968. They have purchased their freeholds out of the savings they have made in your mine?—Yes.

(N^1.) *Children working in Mines.*

(N^1.) CHILDERN WORKING IN MINES.

Joseph Whitwell Pease, Esq.

16,569. (*Mr. Kendall.*) Have you any boys working underground?—Yes, driving the horses and trapping, that is to say, shutting the ventilating doors; we have no limit as to age, but we have none employed in the mines under 10.

16,570. What is the youngest age of those who perfarm the labour of man?—At a guess I should say not younger than 19.

(P^1.) *Education.*

(P^1.) EDUCATION.

Joseph Whitwell Pease, Esq.

16,524. (*Chairman.*) Is that book often submitted to the inspection of the manager?—Yes, it is his book, in fact; and when he comes on to the mines, if he has not been there the whole of the previous day, he knows everything of importance that has occurred. I was going to say that there is on these mines a school, which has cost about 1,200*l.* The Committee of Privy Council on Education granted about one-half of that money, the Commissioners of Woods and Forests providing a site at a very low rate.

16,525. Do the men generally contribute to that school, or only those who send their children to it?—Only those who send their children; they contribute 2*d.* a week per scholar, and the rest of the expenses are borne by the owners of the mines. There is also a reading room which is called the Mutual Improvement Institution, which is well frequented in Guisborough; and there is on the mines another to which we have largely contributed; the reading room is generally well filled.

16,526. Is there any compulsion used with regard to the men?—No; the school is on the British and Foreign principle; there is one in Guisborough, a National School, some go to one and some to the other. We give a subscription to the National School; for although it has an endowment, it is not entirely independent.

(Q^1.) *Time men work.*

(Q^1.) TIME MEN WORK.

Thomas Roper, Esq.

12,166. (*Chairman.*) Have you any night shifts?—Very few; all our ore is more or less mixed with little dirty particles of clay, and if it were got at at night time and thrown out on the heap, the clay would never be picked out. We have women, old men, and boys employed picking the ore, and if they had not daylight to pick it the ore would become dirty, so that we at all times avoid night-work, if we can on that account.

EPITOME OF EVIDENCE.

WALES AND SHROPSHIRE.

(A^w.)—HEALTH AND DISEASES OF MINERS.

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Capt. JOHN DARLINGTON, Minera Mine.

19,925. (*Mr. Kendall.*) You attribute the difference in the health of the men almost entirely to the difference between the strata here and in Cornwall?—Yes.

19,926. Is there any difference in the habits of the men?—I think their habits here are good. I do not know what they have been in Cornwall for the last 25 years.

Capt. EDWARD WILLIAMS, Park Mine, &c.

19,988. (*Mr. Holland.*) Have you observed or considerable difference between the health of the men who work in the chirt and the health of those who work in the limestone?—In this district we have no chirt that they are working upon; but in the Flintshire district there is a great difference. There is about ten years in the average age in favour of those who are working in the limestone.

19,989 To what do you attribute that great difference?—We think that the dust of the stone is more injurious to the men,

19,990. Do you mean injurious to their lungs, or in some other way?—I do not know. The doctors will know that. It kills them sooner.

19,991. In what way does it injure them?—In asthma; they generally die of asthma

19,992. The men working in the chirt are much more liable to asthma than the men working in the limestone?—Yes.

19,993. That you are sure of?—Yes, even in that district.

19,994. Is it due to the badness of the air at all?—I do not know. I think that the dust would act in the same way, without speaking of the ventilation.

19,995. Is there any difference in the quality of the air in mines in the two rocks, except the dustiness?—That I cannot tell.

19,996. Is there any difference in the air of which you are sensible?—I cannot tell that.

19,997. Cannot you tell whether there is any difference in your sensation?—I do not know that I can in those places. It is from the dustiness.

19,998. You are not aware of any difference?—No.

Mr. THOMAS TAYLOR GRIFFITHS.

20,051. (*Chairman.*) Amongst them what was the principal disease?—Asthma. That was a kind of generic term, which included many pulmonary diseases, bronchitis, and diseases of the heart, and obstruction in the lungs; but there was nothing very peculiar: the same diseases might have been produced very much under any circumstances which were favorable to them The complaint which was most specially connected with mines certainly was lead colic.

22,058. (*Sir P. Grey Egerton.*) How does the disease which you call miners' asthma generally commence in this country; by bronchitis?—Yes; and then it depended upon family disposition or individual peculiarities as to its further progress. If there was a family tendency to consumption the bronchitis very often degenerated into consumption. A man might be very delicate or a very drunken man; that modified the ultimate effects of the disease.

20,059. Do you find, in fact, that miner's asthma often degenerates into true phthisis?—No; I do not think that miners were very much disposed to that termination of asthma; as it seemed to be more connected with and more liable to bring on heart disease than consumption.

20,060. In cases of miners' asthma, do the miners themselves attribute it to catching cold, or to being exposed to dust or bad air?—Bad air. I think that there are three circumstances which make miners, especially the younger miners, susceptible of bronchial disease—one is certainly the position.

20,061. You mean stooping?—The cramped up posture, working in a gallery only about three feet any way, so that they must accommodate their position to the nature of the work; they have no choice—that is one thing

20,062. Then, in addition to the deleterious air, the position is such as to prevent the free action of the lungs?—Yes, and the diaphragm.

20,063 And the respiratory organs?—Yes.

20,064. What is the next stage in the progress of the disease?—Supposing a man begins with what may be called asthma, that is to say, supposing he suffers from difficulty of breathing, that perhaps passes off; it is only whilst he is in the mine. It is not that they are liable here so much to any special noxious gases which have a name; it is rather a negative state, the absence of fresh air, from lights burning, and from a number of men destroying the oxygen of the atmosphere; it does not arise, as in the coal mines, from chemical changes naturally existing, but from accidental circumstances; perhaps the place may be a confined gallery with lights constantly burning, and a number of men working, inhaling the fresher air and expelling a quantity of deleterious air with carbonic acid gas; and then certainly what does affect all miners is the absence of sun and sunlight.

20,065. Do you think that the exertion of going up ladders has any effect upon the miner's health?—It may do so, but I cannot say; here it has not been very great; they are not obliged to go quickly, and very often here the ladders are assisted by ropes and chains down a shaft.

20,066. At what period of the disease do you find the complication of heart disease supervening?—What are called their stems here are long, very often 12 hours. I have since learnt that stems in the mine are only of 8 hours continuance. But in most collieries they are all 12 hours long. A man struggles with it, and perhaps he is unwilling to apply or does not apply for medical relief till there is some form of bronchitis established, such as chronic bronchitis, and constant difficulty of breathing, and an obstruction in the air passages or bronchial tubes. The heart, to keep up the due relation betwen its own action and the transmission of the blood through the lungs, has to labour to overcome obstructions; that leads, in some cases, to a thickening of the walls of the heart, or to an over action and attenuation and thinning, or, perhaps, both at once.

20,067. Or valvular diseases?—Valvular diseases sometimes come on, if there is anything in the person's constitution leading to a deposit about the valves, but it does not necessarily follow; it may be and frequently is a disease connected with it.

20,068. Did you ever see black spit in this district?—I never saw it in a miner.

20,074. (*Mr. Leveson Gower.*) Do you think that the health of the miners is inferior to that of the agricultural labourers?—Decidedly. When I was acquainted with them—(I could not speak statistically)—I should think that the average of 45 years was a longish life for a miner.

20,075. (*Mr. Holland.*) Are miners unusually liable to rheumatism?—Yes.

20,076. Much more than other men?—Yes, they are liable to it. With this class of men, unless you investigate their complaints, or they produce an inconvenience, you hear but little of them. But if you took twenty miners walking into this room, and asked them, you would find that most of them were subject to more or less rheumatism, but they would never think of mentioning it.

20,077. Is that rheumatism chronic rheumatism?—Yes; I cannot recal many cases of acute rheumatism.

20,078. You attribute their pulmonary diseases to several causes; you mentioned bad air and inconvenient position?—Yes.

20,079. And what others?—The absence of sunlight for 12 hours, that is half of a man's life. Six months of a year that man passes in an artificial condition.

20,080. Is the dust of the mines likely to cause a pulmonary disease?—To a certain degree, from the chipping off of the stone, and the currents of air keeping the finer particles suspended

20,081. Do you think that the powder smoke is a cause of that disease?—Where powder is used undoubtedly the combustion would assist in destroying the oxygen of the atmosphere.

20,082. The mines are stated to be much warmer than the outer air?—Yes.

20,083. Is the constant change from warm to cold air prejudicial?—Generally speaking; and no doubt miner's bronchitis is very often produced by it.

20,084. By the alterations of temperature?—Yes. A man works below in a higher temperature; he comes up thinly clad, whatever the temperature may be at the pit's mouth. It may be in March; it may be snowing or raining; he retires to a small cabin and puts on some clothes, and then makes his way perhaps over the side of a hill for half or three-quarters of a mile.

20,085. I think you said that all men are liable to disease, but miners in a particular degree?—Yes, all men are liable to take disease from variations of the atmosphere and so on

20,086. But miners are liable to the same thing in a much greater degree?—More frequently in a greater degree.

20,087 Are miners as a class very much more liable to pulmonary disease than other men?—I should not say so.

20,088. You have attended colliers as well as miners?—Yes.

20,089. Is there a marked difference in the condition of those two sets of men?—Certainly. I should say that there is a greater tendency in colliers to pulmonary disease, and that they are not so liable to have heart disease with it; from family dispositions it more frequently ends in phthisis than with the miners. The miner's death is very often caused by obstruction within the chest, either through the lungs or through the openings of the heart, producing œdema in the legs, and hydro-thorax. If you enumerated the causes producing death in a certain number of miners and in the same number of colliers, I should say that you would certainly have a larger proportion of men among colliers dying of some form of consumption, and with the miners the largest proportion would be those dying from disease of the heart and dropsy of the chest.

20,090. Which class of men lives best at home?—I think the miner; because he is more regular in his habits of living; he is more temperate; he has a better house; he has more cleanly habits; he is a better conditioned man, and therefore eats and drinks under other circumstances; he is not often drunk. The collier will only work five days in the week, and will drink for the remainder of the time; or he will perhaps devote Friday, Saturday, Sunday, and Monday to reguler drinking: he makes no secret of it.

20,091. Is that very rare among miners?—Very rare; as far as my own personal recollection goes, I think that it is a thing almost unknown. You may have had of course a drunken miner now and then; but he was distinguished; he was known.

20,092. Are not colliers much more liberally paid than miners?—I do not know; but they are more regularly paid.

20,093. But notwithstanding the less regularity of payment of the miners they are more regular in their living?—Yes, and they are more provident men.

20,094. Notwithstanding that greater regularity of living, are they more unhealthy?—I should say that their complaints formerly had a more fatal character than with colliers.

20,095. They were shorter lived?—Yes.

20,096. There is no doubt about that fact?—Not in my own experience.

Mr. Edward Williams.

20,097. (*Chairman.*) You have no cases of miners' disease under your attention?—I have not any, and I have come here in obedience to the wishes of the chairman; but I have so little to say, that I really hardly know how to begin to say it. I have no mining cases under my hands at all now.

20,098. But you know of the fact of the men suffering in mines?—Yes, that is very common.

20,099. Do they not apply to you?—Very seldom indeed. I do not recollect that I ever attended them for the miners' asthma.

20,100 Why do you think that they do not apply?—Because I think that they look upon it as a part and parcel of their business. A man embarks as a miner, and he looks forward to the day when he will have this disease; he expects it, he reconciles himself to it, and puts up with it; and I think that he does not seek any advice from, perhaps, the misfortune that we cannot give him much assistance. It is a thing which goes on; he has other complaints; perhaps he may be laid up with a fever or with some other complaint, and then of course an inquiry is made into all the circumstances connected with his case, and we discover that he is labouring also under the miners' asthma. I never recollect being called in particularly to a case of miners' asthma.

20,101. But you have met with it in the course of your practice?—Yes, very often. The men think that there is no remedy; it is a thing which they think that they have to submit to, and they submit to it with the best grace they can, and they drag on their existence as well as they can.

20,102. And you think that it tends to shorten life?—Certainly.

20,103. Do you think that it is general amongst miners?—It is very general amongst the miners working in lead mines.

20,109. (*Sir P. Egerton.*) What is your opinion of the general hygiene of the miners' families; are the families, generally speaking, a healthy race?—I should not hold them up as special examples of healthy people.

20,110. Are they as healthy as the agricultural population of the district?—No, I should say not.

20,111. To what cause do you attribute that?—I do not know that I can attribute it to any one cause specially. I cannot say that they inherit it, though possibly they may do so; but it is the impression on my mind that they are not such healthy people as the agriculturists.

20,112. Cannot you trace that to any cause, either to the habitations or to the habits of the people?—Not absolutely, though in many cases these doubtless have their influence.

Mr. Edward Davies.

20,126. (*Chairman.*) Since you have been in this neighbourhood as medical man attending the mines, have you had any cases under your notice of what is called miners' disease?—I do not know exactly what that term would mean, but I have never found any disease peculiar to miners.

20,127. You have observed no particular affection of the bronchial tubes?—No. I have done so in coal miners, but not in lead miners.

20,128. Have you never found any of their respiratory organs particularly affected?—No, not more than I find in the ordinary agricultural districts.

20,134. Then on the whole you would say that they were a very healthy class?—I should consider them very healthy.

20,135. And as long lived as others?—Yes, I think, equally so.

20,136. (*Mr. Holland.*) Do you say confidently that there is no excess of pulmonary disease among the mining population?—Yes. Since my attention has been drawn to this matter, I have taken particular notice.

20,137. There is no greater amount of bronchitis among them than among the ordinary population?—Just so.

20,138. You say that there is an excess of pulmonary disease generally in the district?—Yes.

20,139. And you attribute that to alterations of temperature?—I do not know to what other cause to attribute it.

20,154. (*Mr. Kendall.*) Notwithstanding all these probabilities which you have heard of, yet you feel certain from your practice that the miners are as healthy as the agriculturists?—Yes, they are.

20,155. And that the miners' children are as healthy as agriculturists' children?—Yes, they are.

20,164. Then the whole of your practice has been amongst miners?—Yes.

20,165. But as far as it has gone among miners and among agriculturists, do you find the health of the one as good as the health of the other?—Just the same.

20,166. (*Mr. St. Aubyn.*) You mean to state generally that, as far as your experience goes, the miners are not liable to any particular complaint arising from their calling?—I cannot name one. I have thought over everything since the question was put to me, and I cannot call to mind one.

Capt. JOHN FLOYD, Westminster Mine.

20,215. (*Mr. St. Aubyn.*) Comparing these mines with the Cornish mines should you say that they were more or less healthy?—I think that these mines are worked on just the same system as the Cornish mines.

20,216. But with regard to ventilation how is it?—I think that the ventilation is quite as good here as there.

20,217. With regard to the health of the men working in the mines do you think that they complain more or less here than they do in Cornwall?—I think that they complain less here than they do in Cornwall.

20,218. Is there less of what you call the miners' disease here than in Cornwall?—Yes, I think there is.

20,239. You think that you suffer less?—Yes.

20,240. Do you think that there is less dust here?—I do not think there is.

20,241. You say that you cannot go up and down as well as you could; does that arise from your being an older man than you were some years ago, or from any other cause?—I am certainly older than I was then, and I have worked very hard and a good deal in mines, which perhaps has affected my lungs, so that I cannot climb now as I could then.

20,242. You think that it is partly from age and partly from the work?—Yes.

20,273. (*Sir P. Grey Egerton.*) What age were you when your health gave way?—I do not know; my health has been failing for the last 20 years. I was abroad in North America for two years, in North Carolina, looking at the mines there, and I think that it injured my health very much; it was very hot there.

20,274. You suffered, you say, from lung disease?—Yes.

20,275. Had you any black spit?—Yes, when I was working, but not now.

20,276. What was the first commencement of your illness: did it begin with catching cold?—I was continually catching cold.

20,277. And then you got worse and worse?—Then I got feebler and feebler.

20,278. Had you any pain across your chest?—No.

20,279. Had you shortness of breathing?—Yes.

20,280. Did you find those symptoms aggravated when you were working in dead air?—Yes.

20,281. Do you think that dust and powder smoke had anything to do with your illness?—I think that dust had a good deal.

20,282. Then it might be the effect of the dust?—Yes.

20,283. Do you think that the powder smoke affected you at all?—I do not think that it did in the commencement at all, but in later years I think that it did.

20,284. Had you any palpitation of the heart?—I suffered a good deal from it some time ago, but I do not now; that is better.

20,285. Can you go up the ladders now?—Yes, but I must go up quietly. I cannot go up the ladders as I did 30 years ago. I think that I climbed too fast when I was young.

20,286. When you found your health failing, did you give up working in the mine?—When I found my health give way I was obliged to take it more quietly.

20,287. Did you put yourself under medical treatment?—Yes; I had some medicine from the doctors.

20,288. Did they advise you not to go on working?—No.

20,289. They let you go on working?—Yes.

20,290. Was that when you were working in Flintshire?—Yes.

20,291. When did you cease working underground?—It is nearly 30 years ago.

20,292. Has your health been good since?—No; my health has been poor ever since then.

20,293. Do you think that your health is worse than it was?—Yes; a great deal.

20,294. And you attribute it to the effects of the disease which you had when you were working underground in your youth?—No; I cannot tell what brought it on.

20,295. I thought you said that it was brought on by working underground?—No; I did not say that it was brought on by working underground, but I have been affected now for years.

20,296. But it was aggravated by working underground?—Yes; it fretted me very much; I was worse than I am now.

20,297. You were continually catching cold; and you attribute your illness to working underground, and getting hot and coming up to the surface in a perspiration, and not taking care of yourself when you arrived at the surface?—I dare say that it is a good deal from that.

20,298. (*Mr. Holland.*) Are you very liable to catch cold?—No; I am better than I was.

20,299. You say that you think that the mines here are cooler than in Cornwall at the same depth?—Yes

20,300. What is the cause of that, in your opinion?—Zinc strata is more porous. I think the copper mines are generally hotter than the lead mines.

20,312. Are a good many of your men affected in their chests?—A good many have been so affected about the country, but I do not know that they are all our men.

20,313. At about what age do they generally become affected?—It depends entirely upon where they have been working, whether in bad air or in good; some men are affected sooner than others.

20,314. Do a large proportion of the men become affected at about 40 years old?—I think about 50 generally.

20,315. Is it so large a proportion as to be remarkable among them?—No, I think not.

20,316. Have you many miners who attain the age of 50, without being very greatly affected?—I do not know, it may be so. You may find men in the country who are not affected at all

20,317. Is it usual for them to be not affected when they are so old as that?—I do not know. The men in this country are not brought up entirely to mining the same as they are in Cornwall; they are brought up in farming, mining, and jobbing about; but the miners in Cornwall generally commence in the mines when they are young, and they continue in the branch that they are brought up to.

Mr. GEORGE HUGHES.

20,356. (*Mr. Leveson Gower.*) Did I understand rightly, that you attribute the higher poor rate of the mining districts, compared with the agricultural districts, to the greater unhealthiness of the miners?—I cannot account for it in any other way. The pressure upon the poor rate must be from the number of paupers in the parish, and if it is not the miners that cause it I do not know what does it.

20,363. (*Mr. Kendall.*) Or is it more to worn out miners?—I suppose both; the young men die as well. There is a certain kind of stone which does not agree with them; we have a certain stone at times which tells very heavily upon a man's health, and it is so in all mining districts that I have been at. At Talargoch it is so.

Capt. JOSEPH NINNIES, Maes-y-Safn Mine.

20,428. (*Mr. St. Aubyn.*) Speaking generally, what should you say was the condition of the miners here as compared with that of the miners in Cornwall as to health?—I should say that it was equally as good; I I am not much acquainted with the district, I have only come from Cornwall about two years, and have been confined to the mine that I am engaged in.

23,430. Not better?—No, I do not say that they are; it depends upon the management of the mines in Cornwall. Where there is pretty good management, there is pretty good ventilation. Where the management is defective, the ventilation is defective.

20,431. Is the management better here generally than it is in Cornwall?—It is just the same.

20,432. In Cornwall you knew men who were suffering from the miners' disease?—Yes.

20,433. Do men suffer from that here?—I have known of one or two cases of men, about 50 or 55, I should think that it was what they call the miners' consumption.

20,434. Do as many suffer from it here as in Cornwall?—I should think not.

20,435 To what cause do you ascribe that difference? —Perhaps it may be from a difference in the ventilation of the mines, or the purity of the air underground; I do not know any other cause of it; but I think that this is a very healthy climate.

20,436. Do you mean to say that the air is more healthy above ground in Wales than it is in Cornwall? —I do not know. I get on a little better here than I did in Cornwall, there, there are different gases. I am no chemist, but I question whether lead would throw off the gas that copper does. Copper and mundic or iron pyrites may be more injurious to the constitution than lead.

20,437. You think that the better health of the miners is owing to the nature of the mines?—Yes.

20,438. And not owing to any improved system of ventilation?—No.

20,439. Or any improvement in the management?—No.

20,440. (*Sir P. Grey Egerton.*) Are you of opinion that working in limestone is more healthy than working in killas or granite?—I think that limestone is pretty good, but I think that the shale is heavy; there is some little shale in our mine, and the miners complain that they get into that rock to work.

Mr. Robert Parry.

20,509. Is lung disease very unusually prevalent among them?—It is a very common disease among them. Lung disease is the principal disease which the lead miners have.

20,510. Have many miners the disease before they apply for medical assistance?—They are ill for many years, and they say that they are not ill, and they do not apply unless they contract to pay the medical man, and, then they will come at any time they like; but others do not apply at all, or very seldom. The fact is, that they cannot afford to pay.

20,514. Does the disease come on very slowly?—A boy goes to mine work here at 11 or 12 years old, and they do not complain much until they are 25 or 30.

20,527. We have been told that there is not a special amount of lung disease among miners; are you of that opinion?—No.

20,528 You are quite sure that there is?—There cannot be a doubt about it; I could bring you the miners to show you. At this time of year the bottom of the place is very close, but then the miners work a great deal upon land at this time of the year; the miners go out to harvest; they go out a great deal to the hay harvest.

20,529. Do they mend in health after working at the harvest?—Yes; they have good health then, and they go to the corn harvest. Mine work in this country is not so good as it used to be. We have hardly any lead mines in Flintshire, unless it is at Talargorch.

Capt. Francis Evans, Bryngwiog Mines, &c.

20,576. (*Mr. Kendall.*) Is the health of the miners generally throughout this district pretty good?—Very good.

20,577. Do they suffer much from cough and asthma and that sort of thing, or not?—Not to the same extent that Cornish miners do.

20,578. Notwithstanding that they drink more than the Cornish miners?—A good deal.

20,579. Still their health on the whole is better?—We do not see many sick miners amongst them. They take a great deal more care of themselves.

20,580. You mean that they do not work so hard?—They do not work to the same extent, and when they get to a certain age they manage to do without working somehow. They go off to farming, or get a little venture by themselves, and do a little.

20,581. After they get to a certain time of life they contrive to get other occupation?—They will leave off underground work if they can once get a little venture of their own, as they call it, where they can pick up just a little piece of lead. They live cheaper than Cornish men; at least they are more contented.

20,666. (*Sir P. Grey Egerton.*) Do you find that colds and coughs are prevalent here?—They are not.

Dr. Jesse Conway Davies.

20,737. (*Chairman.*) During your practice have you had under your care any men who were working as miners?—Constantly.

20,738. Have you observed that they are affected in any different way from other classes?—Yes; we find that they are affected with what we call the miners' asthma.

20,739. Do you observe that in its incipient stage; how does it first develop itself?—Very often it comes on like the symptoms of chronic bronchitis, at other times it comes on with symptoms of affection of the heart—enlargement of the heart.

29,740. Should you consider that the lives of the miners are shorter than those of men in other employments; that their lives are shortened by their occupation?—No doubt of it.

20,741. In cases which come to you have you ever observed them get perfectly free of it; do they recover completely?—No, not if they have been working in mines for some years; but if they have only been for a few years, from seven to ten years, and they are recommended to change their occupation altogether, and do so, then they get free from it.

20,742. But if they persevere in their occupation they seldom recover?—Just so. Miners generally calculate upon working for twenty years; they say, "If we do not continue at it much more than twenty years we may escape." But it is not often that a miner escapes entirely; at least that is my experience.

20,743. (*Mr. Holland.*) Do a very small proportion of them escape if they work twenty years?—As far as I can recollect and call to memory there are very few indeed who escape if they have worked for twenty years.

20,744. If they work steadily on for twenty years as miners?—Yes, and some of course suffer much earlier than that.

20,745. At about what age do they generally begin decidedly to fail in health?—If a miner has been working in a mine from childhood then he will not go very much beyond 40 before his health fails.

20,746 At what age do they generally begin working underground?—They go as soon as they are able to do anything.

20,747. At 16 or 18?—Earlier than that.

20,748. They work underground younger than that? —Yes.

20,749. (*Chairman.*) Have you any cases at present which could be seen?—No; I have made inquiry since I saw your lordship, and it so happens that I have not at the present moment any case. If the inquiry is to be extended over some short period then I am sure that I could produce cases. I intend making post mortem examinations as early as an opportunity is afforded me, and also as often as I can meet with subjects, so that I might arrive at the true pathology of the disease.

20,750. (*Mr. Holland.*) To what cause do you attribute the miners' asthma chiefly?—I fancy myself that it must be a complication.

20,751. What are the complications?—It is complicated with emphysema, enlargement of the heart, and bronchitis.

20,752. To what circumstances attending their employment do you attribute these complaints chiefly?—To the want of oxygen.

20,753. Poor air?—Yes; bad air in the mine.

20,754. Do you think that they breathe sufficient dust to produce much irritation of the membrane?—No, I think not.

20,755. Do you attribute much to powder smoke?—No, I do not think that the men do.

20,756. Do you think that much of the mischief is to be attributed to coming out of the mines hot and getting cold?—That is the case sometimes; it produces a cold, and with those who are at all prone to congestion of the membrane it will produce bronchitis. Of course that will assist; and I think that it is bad air, the want of oxygen. The blood is not thoroughly decarbonized, and therefore the pulmonary circulation must be retarded in consequence; and there is a tendency to congestion of the mucus membrane of the air passages and of the lungs, and then a greater work is thrown upon the heart, and an enlargement takes place.

20,757. Are a large number of the men ill before they apply for medical aid?—Yes, very often; in fact the miners consider, when they get 45 or 50, and begin to feel a difficulty of breathing coming on, and a cough and expectoration, and so on, "Well, it is the miners' complaint." They suffer considerable distress, but they do not apply for medical aid.

20,758. We were told at Wrexham that the miners were in the habit of considering their complaint incurable, and that they bore with it; that is the case here?—Yes. If they have a medical man that they can go to, if there is a club belonging to the mine, then of course they very often go; but they consider generally among themselves here that if once they are affected with miners' asthma it is incurable.

20,759. Have you noticed that miners are more liable to phthisis, true consumption, than other men?—No.

20,760. (*Mr. Leveson Gower.*) Do you attend any colliers?—Yes.

20,761. Is there any mining disease among them?—No, we do not observe much here.

20,762. Have you ever seen a case of it in a colliery?—No, I never saw a case among colliers here of the black expectoration, or anything of that sort; nor have I seen any cases where I could say that they were suffering on account of working in collieries.

20,763. To what do you attribute the difference; better ventilation?—Yes. Collieries are much better ventilated than mines generally.

20,764. (*Sir P. Grey Egerton.*) I think you stated that the miners' disease sometimes originates in cold?—Cold very often assists, and may prove a serious complication.

20,765. As far as you have had an opportunity of observing, are the miners a careful set of men or not, as to changing their clothes when they come out of the mine; do you think that they take the necessary precautions so avoid catching cold?—I think so.

20,766. Is it the general habit of the miners here to change their clothes when they come to the surface before walking home?—Yes, generally; especially in large mines.

20,767. Are proper places provided for them for changing?—Yes, generally.

20,768. Have you visited the dries, as they are called?—Yes.

20,769. Do you think that they are adapted for the purpose?—Yes, I think that they are.

20,770. Do the adventurers supply the miners with water to wash in the dries when they come out of the mine?—I could not say that. I have not made inquiries into that.

20,771. Is it your opinion that if proper places were provided, and the men took advantage of them, it might obviate the predisposing cause of the miners' disease, as far as catarrh is concerned?—Yes, decidedly. There is no doubt about that. Dyspepsia follows miners' asthma on account of the congestion of the stomach and liver which takes place, and often also of the kidneys, producing albuminuria. The portal system is frequently implicated, and the patient has hemorrhage often from the bowels, and piles is a common complication.

20,772. (*Mr. Holland.*) Are miners unusually liable to dyspepsia?—No, I do not think that they are particularly.

20,773. Are they unusually liable to rheumatism?—No, I do not think that they are. I think that farmers' labourers are more liable.

20,774. Miners are not remarkably so?—No,

20,775. (*Mr. Leveson Gower.*) Do you see any difference in the health of the miners in the different mines; do you consider some mines more unhealthy than others?—As regards the mines which are badly ventilated, if foul air or the want of oxygen predisposes to pulmonary congestion and so on, of course the worse the mine is ventilated the worse it is for the miner.

Mr. James Williams.

20,784. (*Chairman.*) During your practice have you many men who are working in mines who come to you for advice?—Yes, a large number.

20,785. Do you find that there is any disease peculiar to miners?—Yes; they are all very liable to what is commonly called asthma. Here the thing is proverbial, and they call it the miner's asthma.

20,786. You refer to those in the metal mines?—Yes, lead miners; not colliers.

20,787. At about what age should you say that they die?—They all die what is called young; some of course live to a greater age. I never made any average of any sort, but I should say at a guess perhaps 45 to 50.

20,788. Do they come to you at the commencement when they first feel affected?—No; as a rule it comes on very insidiously and quietly; the symptoms at the commencement not being so urgent as to prevent their going on with their work.

20,789. Have you any case where a man has recovered?—No, I do not know of an instance.

20,790. They still continue working?—Yes. Their bodily health, as a rule, in other respects is good,—they are simply short-winded.

20,791. In your opinion does that render them liable to other diseases of the chest?—Yes; it commences as a case of asthma, and eventually ends in dropsy, or it brings on consumption or chronic bronchitis.

20,792. In case of death, under what disease do you suppose that it would be registered?—I should say that the majority of them would be registered as cases of asthma.

20,793. They would not be registered as phthisis?—I should think not, except, perhaps, those cases which end in phthisis.

20,794. Is there any register of any kind which would give information with regard to the proportion?—Yes. I happen to be Registrar of Deaths, and I have no doubt I could furnish you with tolerably correct information on the subject.

20,795. Will you have the kindness to do so?—I shall be very happy to do so. The register book in my possession begins in March 1862, and from that date up to the present time there have been 16 deaths of lead miners. I just went over the causes of death, and three out of the 16 have died from other causes than disease of the chest; therefore 13 out of the 16 hove died of disease of the chest, principally asthma, chronic bronchitis, and phthisis.

20,796. (*Mr. St. Aubyn.*) I think you said that you had never known a case in which a man has recovered from this miners' disease?—I have not.

20,797. Do they consult you in the earlier stages of the disease, or do they let it run on till it gets too far?—They let it run on until it incapacitates them from following their work; they then, perhaps, apply to a medical man, and when they get better they resume their work.

29,798. If a man who was attacked with this disease was to consult you in the earlier stages of it, and then was to take some other occupation, such as an agricultural life, do you think that it would be incurable in that case?—I am hardly able to give an opinion upon that point; I have never tested it, but I do not think that the disease could be cured by such means. It perhaps might be suspended for a length of time

20,799. Have you been in the habit of going underground yourself?—No. I have not seen any lead-mine workings.

20,800. What, in your opinion, is the cause which induces this complaint?—I see no cause for it myself, except a man being habitually accustomed to breathe a vitiated and close atmosphere, which is also, perhaps, well charged with dust and powder smoke.

20,801. Do you think that anything arises from climbing the ladders; does it affect the heart in any way?—I think not. In this district there is very little climbing, for the mines are not of a great depth; and, from what I have heard about mining, the ladders are short, and then, perhaps, there is a little incline, and they walk it, and then there are the ladders again. There are other occupations in life where there is a great deal more climbing; sailors for instance. I do not think that that will be found to bring on asthma.

20,802. Have you seen the places where the men change on the surface?—Yes.

20,803. Are they sufficient for the purpose; do they always get dry clothes on when they come up from work?—Yes, they are dry for them.

20,804. You do not think that keeping their wet clothes on, or exposure to the air when they come up from the mine, has anything to do with the disease?—It has a tendency to bring on colds.

20,805. If they do so?—Yes.

20,806. But it is the habit in this district to do so?—A great many do, I think; I often see men walking about in their wet clothes.

20,807. Then you would say that, that as well as the bad air, would affect them?—Yes; but that of itself would not necessarily bring on asthma; it would give them a cold, and there would be an end of it. If a man had worked in bad air, and he is subject to asthma, remaining in his wet clothes would develop it.

20,808. (*Mr. Holland.*) In this disease which you call miners' disease quite distinct from common consumption?—Yes; I look upon it as a different disease altogether, the symptoms are different, and it is in fact of a different character.

20,809. What do you think it is chiefly?—It begins as asthma. I should say that it was emphysema of the lung, complicated, perhaps, with chronic bronchitis.

20,810. When do you think that bronchitis comes on?—It comes on in consequence of accidental circumstances, I suppose. I look upon the disease as beginning with pure asthma, but from accidental circumstances it may go on into chronic bronchitis or phthisis.

20,811. Is there much complication of heart disease with it, in your opinion?—No, not often.

20,827. (*Mr. Leveson Gower.*) Do you know of any lead mine where those who are working in it are generally free from miners' disease?—No.

20,828. Is the disease alleviated or retarded by medical treatment?—It has not much effect upon it, I think, except that it alleviates an occasional attack sometimes. They are worse at times than at others, but the moment they get a little better they go back to their work, and they are just in the same plight.

20,829. In fact it is only cessation from work which relieves them?—Yes. I do not know of anything else which would cure it.

20,830. (*Mr. Kendall.*) I suppose that they are bad patients; they come very late, and if there is the least improvement they go to work again?—Yes.

20,831. They ought to come to you before, and when they do come they do not take care of themselves?—Yes.

20,839. (*Sir P. Grey Egerton.*) I think you have stated that consumption is not uncommon amongst the miners?—No; it frequently comes on.

20,840. Have you ever met with a case of true phthisis being a consequence of the miners' disease where the constitution of the man or of his family has not been of a phthisical diathesis?—I cannot call to mind any particular instance of that sort, and I should myself almost think that it would require a consumptive diathesis to develop the disease in a miner.

20,841. The mischief to the lung tissue in the miners' disease is not necessarily tuberculous?—Exactly; that is what I mean.

20,842. But it is rather an induration or hepatization of the lung?—It is an emphysematous state of the lung.

20,843. Have any of the cases which you have attended been complicated with the black expectoration?—I do not remember any well marked case.

20,844. Whence do you think that that colouring matter arises?—It is supposed to arise from the inhalation of smoke, coal-dust, or other carbonaceous matter.

20,845. Then, if that be so, it is not peculiar to miners' asthma?—No, I do not consider it so at all.

20,846. Therefore the occupation of a miner does not render him more liable to the black sputa?—No, I should say not so liable as that of a collier or other workman more particularly exposed to smoke or coal dust.

Return of ages and causes of death of lead miners in the parishes of Holywell, Halkin, and Ysceifiog:—

Number of deaths from all causes - -	112
Proportion of deaths from diseases of lungs	76
Average ages at death, from all causes -	52
,, ,, from diseases of lungs	50

The diseases of the lungs are nearly all of a chronic character,—asthma, chronic bronchitis, œdema, phthisis, &c. Not more than 6 out of the 76 are of an acute character.

Captain WILLIAM BOWEN, Talargoch Mine.

20,945. (*Mr. St. Aubyn.*) What is the general condition of the miners in this mine as regards their health?—Their health is very good.

20,946. Do any of them suffer from what is called miners' asthma?—Very few. There is only one that I know of who has left the mine for the last six years, and he is a very old man. His name is David Morgan. He has worked in the mine for a number of years.

20,947. He is the only man who has left the mine since you have been here, on account of bad health?—Yes.

Captain MATTHEW WASLEY, Coed Mawr Pool Mine.

21,087. (*Chairman.*) Which are the healthiest men, the miners in Cornwall, or the miners here?—The miners here, because the mines are more shallow.

21,088. Taking a mine as shallow in Cornwall as here, which is the healthiest?—In Cornwall the adits are generally as deep as the mines are here.

21,089. Do you think that there is any other reason besides being a shallow mine why the men are healthier here?—It is possible to have a bad mine shallow as well as deep.

21,090. Do you think that there is any other reason besides being a shallow mine why the miners are healthier here than in Cornwall?—They are very steady in their habits; they are the most steady set of men that I ever came across. I have spent many years in Ireland and in Cornwall; but the men here are the steadiest men I ever met with, and the most honest men in their work, and in every shape and form.

21,091. They do not drink much?—No. I do not know that we have one drinking man in the mine. We have had 30 or 40 men in the mine, and I do not know that we ever had two drinking men who continued to work six months in the mine.

Capt. WILLIAM VIVIAN, Parys Mine.

21,234. (*Mr. Leveson Gower.*) Do you consider the health of the miners good here?—Very good.

21,235. How is it in comparison with what it is in Cornwall?—Very good in comparison.

21,236. Is the health better here than there?—Very much better. We are not troubled with the miners' disease as they are in Cornwall. One old miner worked in our mine till he was 72 years of age, until a month or two ago, from the infirmities of age, he was obliged to give up, but still his breath was as good as that of any average man of that age. The old man who were formerly miners are working on our pits, and they are employed on the roads and in various ways, and some are old pensioners.

21,237. Are the men here generally sober?—Yes, they are generally temperate in their habits, as far as my observation goes, with a few exceptions; we are sometimes obliged to exercise discipline, but they are better in this respect than some others, who are considered above them in the scale of social life.

21,256. (*Mr. Kendall.*) You say that the miners are healthier here than in Cornwall?—Yes.

21,257. Why are they so?—First, because the mine is not so deep, they have not the same stress in climbing; in the next place the ventilation is better than the ventilation of the mines generally in Cornwall, and the mine is comparatively dry.

21,258. And it is not the custom to work such long hours?—No, and they don't work so hard; they do not strain the system as they do in Cornwall.

Mr. THOMAS HUGHES.

21,269. (*Chairman.*) When they come to you do you find any men suffering from miners' asthma?—Not very frequently. There are cases of asthma, but I cannot say that they are very much more frequent than in other classes of people.

21,270. Then there is no disease peculiar to miners?—Bronchitis and consumption I have noticed to be the most frequent diseases amongst the miners.

21,271. Is there any particular age at which you find them liable to that?—No, not particularly. They are generally advanced in years, about 35 to 40, before it shows itself.

(A^{v}.)—HEALTH AND DISEASES OF MINERS.

(A^{v}.) *Health and Diseases of Miners.*

21,276. (*Mr. Holland.*) Have you practised among other persons besides miners?—Yes.

21,277. Is there decidedly more bronchitis among miners than among others?—I believe there is, as well as a good deal of consumption.

21,278. Do a large proportion of the men above 40 suffer from bronchitis or some such disease?—Yes, a good many of the miners.

21,279. Do you think that more than half of the men above 40 suffer from it?—No, not so many as that, I think.

21,280. Is it common for men to have this complaint who do not apply for medical assistance?—Yes.

21,281. They give it up as a bad job?—Yes, very often they go for medicines themselves; they go to druggists, they do not apply to a medical man.

21,282. And they do nothing?—And they do nothing. They very often apply to druggists and old women and quacks for herbs.

21,283. The conclusion from that is that a larger proportion may suffer than those you know, and that you do not see it?—Yes.

21,284. Do you think that the miners suffer more from rheumatism than the farm labourers do?—I believe not in this mine.

21,285. Are they more liable to dyspepsia than farm labourers?—A good many suffer from dyspepsia.

21,286. Is it a common thing among them?—Yes, rather common. It is due probably to eating slops and fluid food for dinner.

21,287. Do they eat differently from farm labourers?—I believe they do.

21,288. Have you noticed that they are more fond of tasty things?—I have not.

21,289 What is their general and ordinary food?—They take too much tea and coffee to the exclusion of animal food.

21,290. Is that from poverty, or from taste?—Poverty, I think. The farm labourers are fed by the farmers in this country.

21,308. (*Mr. Leveson Gower.*) Is there any consumption among the agricultural labourers?—Yes, very much; it prevails very much in this part.

21,309. Do you see any difference between the consumption which the miners have and the consumption of the agricultural labourers, or does it appear to you to be the same disease?—It is very much the same. There appears to be a little more difficulty of breathing, I think, in the miners.

21,310. To what cause do you attribute the ill health of the miners?—Impure air from working underground.

21,311. Any other cause?—I cannot speak to any other cause. They generally get wet from working underground in wet places, and take cold and neglect it.

21,312. Do they change on coming up?—They generally change after going home in this mine.

21,313. Do you attribute their colds to their doing that?—To the impure air, and also to the particles of dust in the air. That often irritates the bronchial tubes.

Mr. Richard Lewis Parry.

21,337. (*Chairman.*) Is there any affection which miners peculiarly suffer from more than others?—Yes, principally consumption and bronchitis and rheumatism.

21,338. They do suffer from rheumatism?—Yes; a great number from sciatica, especially when they get a little advanced in years, 60 years of age or something of that sort.

21,339. At what time do the miners generally become affected in their breathing?—Very early. You can hardly name 50 or 60 men under 30 who are not affected by it; if they keep clear of it till they are about 40 or 50, they get on pretty well after that, but the mortality is amongst the young men principally, say under 30 or 40.

21,340. Have you any case under treatment?—Yes, a great number.

21,341. For this affection particularly?—Yes.

21,342. Do you see any difference between the two mines?—I think there is a great improvement in the Parys mine. There is a great deal of difficulty in the other mine, as far as ventilation goes.

21,343. But there has been an improvement of late years in the Parys mine?—Yes, but it is very lately.

21,346. Do you find when they come to you in the early stage of this disease that you are able to cure them?—No, they very seldom come until they are almost in the last stage.

21,347. They do not apply to you when they are first affected?—No, they merely fancy that it is a common cold, and they hang on at their work, and they go underground and it aggravates it, especially where the mine is not properly ventilated.

21,360. (*Mr. Holland.*) Are the miners decidedly older looking at the same age than the agricultural labourers?—Yes, decidedly.

21,361. What difference in appearance is there?—You may say that a man of about 50 years of age looks about 65.

21,362. Do you mean that he is like a man of 65 in constitution?—Some of them are. There is a very curious case with them, that if they pull through it pretty well till they are 50 or 55 they live to a good age, but the majority of them die before they are 50.

21,363. Do the miners complain much of bad ventilation in the mines?—Yes, very much.

21,364. Is that a very general complaint?—Yes.

21,421. (*Mr. Leveson Gower.*) Are you acquainted with the nature of the miners' disease of the Cornish miners?—No, only from what I have heard.

21,422. But you have read about it, I suppose?—Yes.

21,423. Is there any distinction between the disease which these men suffer from and the Cornish miners' disease?—Yes, I think there is a good deal of difference between the two.

21,424. What is the difference?—The difference is that I do not think there is so much consumption amongst the men in Cornwall, according to what I have read.

21,425. Then you do not call miners' disease there consumption?—No; a good deal of it is hereditary here. Scrofula is very prevalent.

21,426. Do you attribute the illness of the men mostly to their mining or to the state of their cottages?—They are predisposed to it, and then when they get into the foul air and the close breathing, it certainly hastens the disease; it brings it to a crisis sooner than it would if they were labouring men about the fields.

21,427. You mean that they are predisposed to it from the bad state of their cottages?—Yes.

Capt. Richard Ridge, Rheidol Mine.

21,504. (*Chairman.*) Do the men suffer from working?—Yes; I have been underground this morning in some of our levels. When you go in about 20 or 30 fathoms, you will perceive a smell which will almost knock you back,—a nasty, filthy, bad, smell; that is what kills the miners.

21,505. How does it affect them?—It affects their lungs.

21,542. (*Mr. Kendall.*) You spoke of the ill health of the miners; which do you think that it arises most from, checked perspiration, or bad air?—Bad air, I am quite certain of it

21,543. Yours is a dry mine, you say?—Yes.

Capt. James Raw, Cwm-Ystwith Mine.

21,608. (*Chairman.*) Do you think that the men suffer at all from working in the mines here?—No; we have not a sick man in the list; we had one surface man on the list for one week, complaining of rheumatism in his limbs or something of that sort.

21,609. They do not suffer in their breathing at all?—No, except that when they come to get old I think that they get short of breath a little.

21,610. At what age do they become affected?—I do not think that they are affected until they are from 50 to 60.

Capt. Thomas Ball, Lisburne Mines.

21,766. (*Mr. Kendall.*) Can you draw a comparison between the men there and the men here; which are the healthiest men?—I think that the men here are the healthiest.

21,767. Do the men here work as long as they did there?—I do not think that the men here work as hard as the others did, nor as many hours; I have never seen such hard-working men out of Cornwall or Devon as I have in it.

21,768. You mean the Cornish men?—Yes.

Mr. Rowland Rowland.

21,862. (*Chairman.*) Do you see any difference in the health of miners and others?—I think I do.

21,863. In what way should you say the miners are affected differently from others?—I think that it is in consequence of inhaling air containing particles of matter. I think that that is the cause of it, and the effect is, that they are pale and more subject to coughs, and they decay sooner than agricultural labourers.

21,864. Do they come to you in an early stage of the disease?—Yes, they come directly.

21,865. Have you had any cases under treatment where you have been able to give entire relief?—Yes, a great many. When they come early I very often give, when they work underground a great deal, an emetic or ipecacuanha, not that I think it will evacuate anything from the lungs, but still it has the effect of causing a discharge from the numerous membranes of the lungs, and I give them expectorants, and they throw off the foul matter which has been inhaled by working in foul air.

21,866. Do you consider that their digestion or the organs of the stomach are affected by their work?—I think that the lungs are more affected than even the stomach.

21,867. But does it show itself in any way by an affection of the appetite, or in their general state of health?—Yes, I think that they do not eat so heartily as the agricultural labourers.

21,868. Do you ever recommend them not to work at the mines?—Very often; I am obliged to tell them that, and they know it now themselves. When they are beginning to be affected underground they say, "What do you think about my working underground?" I reply, Well, really I think you have now worked for many years underground, and your breath has become short; I recommend you to try to have something to do on the surface, or to go out to work with the farmers. And if they do that they recover themselves a great deal, but if they go back to the mine they very often die in less than 12 months.

21,885. (*Mr. Holland.*) Have a large proportion of the miners who survive 40 the disease which you speak of?—A great many die under 40.

21,886. Of those who survive 40, are a large proportion affected in their lungs?—Yes, a good many from 40 to 50.

21,887. With cough and expectoration?—With cough and an expectoration of a bluish substance from the lungs; bluish phlegm.

21,888. Have you ever been able to detect solid particles in the phlegm; have you looked for them?—Yes, I have looked with a microscope. I do not think that I have discovered any particles of lead at all.

21,889. Have you discovered any particles of grit?—Yes, I have.

21,890. And of carbon?—Yes; sometimes they spit quite black for days after coming out of the mine.

21,891. How long will they spit that particular sort of black spit after leaving the mine?—For days and sometimes weeks; but the sputa of people who have been working in mines even for two years is rather darker than usual. From that kind of bronchitis which they have, there is a darker sputa than we have in other people. I think that it is from some affection of the lungs. I have not had many opportunities of a post mortem examination, but it is a darker secretion.

21,899. (*Sir P. Grey Egerton.*) What is the general health of the population of this district apart from the mining population?—The health is pretty good.

21,900. What are the prevalent diseases?—We have all diseases. Sometimes we have epidemics, such as scarlet fever, many years ago we used to have more fevers than we have now; we do not have many fevers now. We had a very bad epidemic, the scarlet fever, at Cwm Ystwith a few years ago; I think that it was entirely from contagion; it came from another place; one family went to a funeral and brought it home and got ill, and then it followed from one side of the river to the other, and then one family came from the hill a long distance to this side, and it spread.

21,901. Did it spread among the mining population as much as among the other inhabitants of the district?—Quite as much.

21,902. Have you much phthisis among the poor people here?—Yes, we have a good deal of phthisis.

21,903. Do you find that miners are as subject to tubercular disease as the people who work upon the surface?—Quite as much. We cannot always distinguish; there is a bronchial ulceration of the lungs, with difficulty of breathing, and cavities forming, so that we do not know exactly whether it is from original phthisis, or whether it is from ulceration from particles.

21,904. Would not that rather be called emphysema of the lung?—Emphysema would be from ulceration and wind getting into the vesicles.

21,905. Have you ever seen a case of miners' asthma graduating into phthisis or terminating in phthisis?—Yes, I have.

21,906. Is that common?—No. I have had it in people from 40 to 45. I have seen some cases of it.

21,907. Have you ever seen such a case where tubercular disease has not been constitutional in the family?—Yes; I have had a case lately, where a man died. He was a miner, and I think that he was very healthy till he worked in the mines, and then he became phthisical, he was a Cornish man.

21,908. Did any of his family die of tubercular disease?—I did not make much inquiry as to that. It is almost impossible to decide whether they are phthisical or asthmatic; for a long time they feel as if they are asthmatic, but from that they get phthisical.

21,909. Would not an examination by the stethoscope give you the diagnosis of the two diseases?—Yes, but not distinctly enough; we cannot trace it now; any consolidation of the lung would be very nearly the same as tubercles.

21,910. But you could distinguish between hepatization of the lung and abscess of the lung by the stethoscope?—Yes, that would be nominally.

21,911. Do you ever find the miners' disease complicated by heart disease?—Yes, in some cases we do.

MR. EVAN ROWLAND.

21,923. (*Chairman.*) Do you think that the miners are subject to any peculiar disease?—They are subject to a cough, which I believe is brought on through damp and foul air at times.

21,924. Do you find it prevail to any extent?—Not a great deal.

21,925. Do they come to you in the earlier stages of the disease?—They come when they begin to cough.

21,926. Are you able to relieve it?—Yes, in a great measure.

21,927. Do you ever find cases where you recommend them to give up working?—Very few; at Goginan and that neighbourhood, they are more birds of passage; they are not the same as they are on this side, brought up in the neighbourhood, and living here, very few people live at Goginan now who were living there 20 years ago.

21,932. (*Mr. Holland.*) Is there an excess of lung disease among the miners, as compared with other men?—They are more subject to cough than the agricultural labourers.

21,933. Is that cough more obstinate than with the agricultural labourers?—Yes, a great deal.

21,934. Does it come on at any particular time of life, or is it at all ages?—It comes at all ages, but I find that it comes most frequently about 40 years of age.

21,935. Do those who get to the age of 40 have habitual cough?—Yes, they are very subject to cough.

21,936. Do you think that a large proportion of the men above 40 are quite free from cough?—I believe about one half at an average.

21,937. They are not permanently ill?—No.

21,938. Do they often die of the cough?—Very seldom. I have had a little to do with different districts, and I find that the mines on our side are a great deal better ventilated, taking them altogether, than in any other part of the country, I believe.

21,939. Do the men complain much of dust?—At times they do, not a great deal; there is no sulphur in the mines about here, so that they do not complain so much of it.

21,940. You know the disease which is commonly called miners' asthma or miners' consumption?—Yes, very well; I have seen it in Cornwall, but I have not met with it once in my neighbourhood.

MR. JOHN GRAHAM WILLIAMS.

22,005. (*Chairman.*) Do you consider that there is any difference in the health of the miners and of the farm labourers?—Many of the miners are labouring under sickness.

22,006. Of what form?—Generally consumption.

22,007. Disease of the chest?—Disease of the chest.

(A^{v}.)—HEALTH AND DISEASES OF MINERS.

Health

Mr. William Eddowes.

22,223. (*Mr. Holland.*) Can you explain the cessation of that disease?—I do not recollect now, it is so long ago. I did not attend the miners then, but I was called in in a number of cases. I know that it ceased about 20 years ago.

22,224. Are they still working in carbonate of lead?—They are still working in the same mine, but I do not think that they find carbonate of lead now.

22,225. You said that there was no particular excess of lung disease among the miners?—No.

22,226. Do they live as long as other men?—Yes.

22,227. Are many of them above 50?—Lots of them are 60 and 70.

22,228. Are the men above 50 in fair health?—Yes; there is one man now who has become infirm within the last few months, who has worked on the mine between 50 and 60 years.

22,229. Do they look as young as other men of 50?—I do not see any difference in them excepting perhaps a few; but they all look very well.

22,230. Are they ruddy as other men?—Yes, I see little difference.

22,231. Would you know a miner from an agricultural labourer if he had his Sunday clothes on?—They are rather smarter fellows.

25,241. (*Sir P. Grey Egerton.*) In the course of your practice have you ever seen a true case of miners' asthma?—No, I do not recollect that ever I have.

22,242. Are you acquainted with that disease by reading?—You mean such as cutlers get from very fine particles?

22,243. It is a bronchial affection passing on to the lungs and ending generally in death after a few years.—We get none of it here.

22,244. Are you acquainted with it elsewhere?—No, only so far as seeing an account of asthma, and the different causes.

22,245. Are you acquainted with the symptoms of true miners' asthma by reading or by practice?—Do you mean in miners working in lead mines, or copper mines, or tin mines, or what mines?

22,246. All mines. There is a peculiar disease to which all miners are subject, whether it is in lead or copper, or zinc or coal?—I have seen it in coal and where the expectoration is perfectly blue.

22,247. Then you are acquainted with that particular disease which is called miners' asthma. Yes; but I do not think that it is miners' asthma. I know that some writers call it so. I have seen two cases of that kind of asthma, but never in a miner; they were both colliers.

22,248. Are you sufficiently acquainted with the disease called miners' asthma to state positively that you never attended a case of it in the miners employed in the Snailbeach mine?—Yes, and I have attended perhaps as many as 500 miners in a year; but I have seen it in the colliers here.

Mr. John Hughes.

22,250. (*Chairman.*) You have had the charge of the Gravels mine?—Yes, for about the last year and a half.

22,251. Do you find that there is any difference in the general health of men working as miners from that of other labourers?—I certainly get more cases than I have done in another appointment which I held as medical officer to a parish, but I have never had one serious case since I have attended the mine.

22,252. What are the sort of cases, are they pulmonary?—Generally speaking they are connected with pulmonary disease. I have had a good many cases of dyspepsia. The men say that the air is not very pure, and they have a good deal of pain after eating, and that sort of thing. I give them a little medicine and they get right, but I never had any serious case of illness consequent upon having worked in a mine.

22,253. But you think that the men are somewhat affected by the work?—Yes. If I had a lot of miners to examine for a life assurance society, and a lot of agricultural labourers; my opinion is that the majority of the agricultural labourers would be better lives than the miners.

22,254. What number of years should you say?—I should not like to say much more than 50 or 55 years for a miner.

22,255. (*Mr. Holland.*) About five years difference?—Yes, I should think so.

(A^{v}.) *Health and Diseases of Miners.*

22,256. (*Chairman.*) You have had no cases which have not yielded to treatment?—No, I have never had one.

22,286. (*Mr. Holland.*) Have you seen much of the disease which is called miners' asthma?—No, I never had more than, I should think, five or six cases of it.

22,287. Have you formed a clear opinion of its nature?—No, I do not see any very great difference between it and cases of asthma which are met with independently of working in mines.

22,288. Do you think that it partakes more of the nature of bronchitis or of emphysema?—Sometimes I have imagined it to be more emphysema than bronchitis.

Capt. Thomas Henwood, Snailbeach Mine.

22,336. (*Mr. Kendall.*) Did you work in Cornwall before you came here?—Yes. I worked under Capt. Puckey from my boyhood up till I came here.

22,337. Did you ever work in the Fowey Consols?—Yes.

22,338. Did you ever work in the deep levels there?—Yes, in the 220 fathoms level.

22,339. It was very warm there, was it not?—Yes, very hot. I used to work naked.

22,340. Did you suffer much there?—Never, except when I was aged about 17; I was working at the 210 before the circulation changed at Botterills, and I had a heart disease.

22,341. Do you think that that was from going up and down the ladders, or from cold?—From going up and down the ladders.

22,342. Have you quite recovered?—Yes.

22,362. (*Mr. Holland.*) What disease have the Cornish miners more than the miners here have?—They are generally attacked with disease of the heart and bronchitis in Cornwall.

22,363. Have they that here?—Seldom, I believe.

22,364. Do you know the disease which they call miners' asthma in Cornwall?—Yes.

22,365. Is that a common disease here?—I do not know that it is.

Samuel Jones.

22,426. (*Mr. Holland.*) Are you a miner?—Yes.

22,427. How long have you worked as a miner?—I have worked for 22 years here and 4 years elsewhere.

22,428. Are you aware of any disease to which miners are more liable than other men in this district?—No, not that I know of particularly.

22,429. Have you heard of a disease called miners' asthma in other districts?—No.

22,430. Do you consider that miners are more liable to cough and similar diseases than other men?—No, not more than other men that I know of particularly.

Capt. Richard Henry Vivian, Roman Gravels Mine.

22,535. (*Mr. Holland.*) You have had opportunities of observing the miners in all those districts?—Yes, and I have been a working miner nine years in Cardiganshire, South Wales.

22,536. Of course you have seen the disease commonly called miners' asthma?—Yes.

22,537. Have you any of it here?—No, I do not think that we have a single case here.

22,538. Have you seen it in this immediate district?—No, I think that we are as clear from it in this district as anywhere at all. I think that the mines are generally speaking more healthy here than in any other district, because they are not deep.

22,539. Have your miners any excess of disease of the lung over other labourers?—No, I think not a single one.

23,540. And there has not been any excess of that disease, in your experience?—No.

22,541. To what do you attribute their exemption from that disease?—To the good ventilation of the mine, nothing else. We have men here working who are between 70 and 80.

22,542. Have you as much climbing here as you have been used to in other districts?—No, we have only 80 fathoms here altogether, and I have been used to climbing 190 fathoms.

(A^{w}.) *Health and Diseases of Miners.*

(A^{w}.)—HEALTH AND DISEASES OF MINERS.

22,543. Do you attribute the exemption from the disease partly to the less climbing?—Yes, because the deeper the mines go the air gets more impure.

22,544. Do you think that that is the only cause, or is it the absence of climbing too?—I do not think that the effect of climbing has much to do with the constitution because miners generally take their own time. It is the bad air that I think kills the miners, and brings on these diseases.

22,545. Does 190 fathoms climbing not hurt a healthy man?—Certainly, to a certain extent, but I think nothing to equal the working in bad air and in places which are not properly ventilated; it is the working that does the harm, and of course the climbing in the deep levels in Cornwall must be dangerous as well, but I would rather climb than ride at any time.

Mr. John Vivian, Roman Gravels Mine.

22,566. (*Mr. Holland.*) You know the disease called miners' asthma, in the north of England?—Yes, I have seen many cases of it. I have seen men at 40 and 43 years of age completely knocked up at Alston Moor.

22,567. Have you seen any cases of it here?—I cannot say that I have seen exactly that kind of thing.

22,568. Do you consider the miners here free from any particular affection of the lungs?—Yes, I should fancy so.

22,569. They are not much more liable to it than other men?—Not at all, I should say.

22,570. Do you consider that the miners at Alston Moor are better lodged and fed than the miners here?—Yes, far better.

22,571. And yet, notwithstanding that the miners here are much more healthy?—Yes, on account of the different system of mining.

A b^{w}.) *Age nd Appearance f Miners.*

(b^{w}.)—AGE AND APPEARANCE OF MINERS.

Capt. John Darlington, Minera Mine.

19,917. (*Mr. St. Aubyn.*) Can you tell us, in a few words, to what you ascribe that difference?—I imagine that there is an immense quantity of a foul kind of air which is always hanging about the killas in Cornwall, a sort of carbonic acid gas which is always hanging about it, and the miner inhales that, and consequently it brings on what they call a decline in Cornwall, but you never find that here. I most positively declare before you that I think that the average life of every miner in this country is above 55 years of age.

Mr. Edward Davies.

20,170. (*Mr. Holland.*) Do miners of 50 look as young as agricultural labourers of the same age?—Some of them look equally well.

20,171. I mean as a class?—Not meeting with an equal number on each side, I can hardly contrast them; the agricultural district here is comparatively very thinly populated.

Capt. John Floyd, Westminster Mine.

20,213. (*Mr. Leveson Gower.*) At what age do the miners generally leave off work?—We have some miners of 60 or 70 years of age working now. They generally leave off working at from 60 to 70.

20,318. (*Mr. Holland.*) At what age do they generally begin working as miners here; are they generally fully grown men?—Quite young men.

20,319. They do not begin as boys?—No, not so young as they do in Cornwall.

20,320. Do you know about what age they are when they begin?—I should think from 18 to 20.

20,321. Rarely below 18?—I think that there are very few under 18 here.

20,322. Do men begin mining at 20 and 25?—Yes, I have known many men come from farms and from the surface.

20,323. Have you noticed that those who begin later in life bear the work better, or worse, than those who begin young?—I do not think that they are affected so soon.

20,324. Those who begin later in life, at 25 or so, are not affected so soon as those who begin earlier?—No, I think not.

20,325. You mean that they work a greater number of years before they become affected?—Yes, I think so.

20,326. Have you sufficient cases of that to be sure that that is a correct observation?—I do not know, I never studied the matter.

(A b^{w}.) *Age and Appearance of Miners.*

Capt. Joseph Ninnis, Maes-y-safn Mine.

20,452. (*Mr. Kendall.*) Out of the 210, have you 20 men working of 60 years of age?—I think that we have.

20,453. Have you five men of 65?—No, hardly, underground: we have three old men 70 years of age and above.

20,454. Do you take in any men above 20 who never were miners to work underground?—Yes, we have done so; first of all they go to fill the kibbles and underground waggons, then they get in as labourers, as bargain men, and so on.

Mr. Robert Parry.

20,518. (*Mr. Holland.*) At about what age should you say that they begin to show evident disease?—Between 40 and 50. A miner is a very old man I should say, in his constitution, at 45.

20,519. Are there many miners of 45, who are quite sound in their lungs?—I do not think that there are many of 45 who are not affected if they are constantly underground as common miners, though agents and others who do not go underground often are not so affected.

20,520. Do you consider a miner of 45 an old miner?—Yes, and at 50 a very old miner upon the general run.

Capt. William Bowen, Talargoch Mine.

20,948. (*Mr. St. Aubyn.*) Have you any old men working on the mine?—Yes.

20,949. Have you many?—Yes.

20,950. Above 60 years of age?—Yes.

20,951. How many have you upwards of 60?—We have one 77 years of age. He is at home now. He had a slip, and hurt himself a little, or he would have been here.

20,952. Up to what age do they generally work in this mine?—They work up to 60 and 70.

20,953. As a rule?—There are some as old as that

20,954. As a rule, speaking roughly, if a man comes here to work when he is 18 or 20, how long will he continue to work?—He will work here for 40 years.

Capt. Matthew Wasley, Coed Mawr Pool Mine.

21,128. (*Mr. St. Aubyn.*) Up to what age do they generally work in this neighbourhood?—I do not know much about that.

21,129. Older than they do in Cornwall?—Yes, I suppose they do, generally speaking.

21,130. To what do you ascribe that; better ventilation?—To the mines not being so deep, and not so distressing to the lungs climbing up. They dwell more convenient to the mines here, they have not so far to walk, and the mines are not so deep, and there are many things.

21,131. There is better ventilation, and not so much climbing?—Yes. Climbing is very distressing; I have found it so.

Dr. Thomas Hughes.

21,291. (*Mr. Holland.*) Do you think that they live better than the miners?—As a rule, I think so.

21,292. Can you distinguish a farm labourer from a miner?—I think so; old age, I think, comes on earlier in a miner.

21,293. How many years difference should you say there is?—10 or 15, I should say.

21,294. As much as that?—I think so decidedly; in underground men, at least.

21,295. Do you think that a miner of 50 looks as old as a labourer of 65?—I think so, as a rule. I mean labourers working for farmers, because they are generally very healthy, being always in the open air. That air of course is pure.

Mr. Rowland Rowland.

21,869. (*Chairman.*) Should you say that the life of the miners is shortened by their work?—Decidedly; I think from my observation of the last 20 years or more, that 10 years would be taken from the life of a man of 60; a man of 50 as a miner would be as old as another man of 60.

(A^{w}.)—HEALTH AND DISEASES OF MINERS.

Age

21,870. Do you think that there is any difference from a man beginning as a miner at a more mature age?—Yes, I think that the agricultural men will stand it best. I do not think that being accustomed to it like an apprentice is a good thing. I think that they die sooner if they go earlier, that is my observation. I have no particular statistics, but I know that people who have been in agricultural labour till they grow up pretty strong stand it best; that is my experience.

Mr. Evan Rowland.

21,958. (*Mr. Holland.*) Do miners at 50 look older than other miners at 50?—They will look more pale and sallow.

21,959. Do they look decidedly older, or not?—I am sure I do not know.

21,960. You have not noticed that?—No, I have never noticed that.

(c^{w}.)—FOOD OF THE MINERS.

(A c^{w}.) *Food of the Miners.*

Capt. Francis Evans, Bryngwiog Mine, &c.

20,582. (*Mr. Kendall.*) They do not live so well as Cornish men?—No. The Cornish men as far as animal food goes, I think, make use of more of it; bread and butter is the principal diet here. They are more contented with their coarse living.

20,583. They have more money, the living is cheaper, and they drink more?—They spend it in drink. They have a custom, no matter what family they have, of giving their wives 12*s.* a week and no more, and spending the rest.

20,584. It is an understood thing?—It is a custom amongst them.

20,585. That the home consumption is 12*s.*, and whatever the size of the family is the man drinks the rest?—Yes.

20,586. (*Sir P. Grey Egerton.*) If he gets 15*s.* a week he only keeps 3*s.*?—Yes.

Mr. Richard Lewis Parry.

21,398. (*Mr. Holland.*) Do they feed badly?—Very badly.

21,399. In what respect?—In not having sufficient.

21,400. Is that from their poverty?—From their poverty and bad pay.

21,401. We are told that they get about 13*s.* or 14*s.* a week?—Some of them. Sometimes a family of 10 or 12 get 14*s.*, or if they get 10*s.* or 14*s.* they are pretty well off, but sometimes they will not make 5*s.*, and then they run into debt, and if they exceed that then it is deducted out of their pay again. They may run into debt for months and months.

21,402. That is a better income than farm labourers usually get, is it not?—No.

21,403. Do farm labourers here get more than 14*s.* a week?—They get upon the average 8*s.* or 10*s.*, and then they are allowed the privilege of a cow, that is if they are married.

21,404. Do the farm labourers live better than miners?—A great deal better.

Mr. John Hughes.

22,275. (*Mr. Holland.*) Which do you think feed the best?—I should say the miners decidedly.

22,276. Do they feed as judiciously as the agricultural labourers?—I think that they do.

22,277. Are they more fond of tasty food?—You do not find the mining population eat salt meat so plentifully as the agriculturists do. All the farm labourers live upon bacon, salt meat, from the beginning of the year to the end; and those diseases which we generally meet with amongst agricultural labourers, we do not meet with amongst miners. I think that they have more fresh food.

22,278. Do the miners eat fresh meat nearly every day?—I think they do.

22,279. Do they live decidedly better than the agricultural population?—A great deal better. My reason for saying so is, that the butcher who supplies me supplies most of the miners in this locality, and he has told me the quantity which they buy of him; in fact he has a very good trade through them.

(e^{w}.)—SMELTERS.

(A e^{w}.) *Smelters.*

Dr. Thomas Taylor Griffiths.

20,052. (*Chairman.*) Did you find that with men working underground?—No, it was chiefly with men who were obliged to reside within the atmosphere of the smelting houses; there were three at that time.

20,053. And they suffered?—Yes, especially.

Mr. William Eddowes.

22,213. (*Chairman.*) Are the smelting works in the neighbourhood?—The smelting works have been removed within the last 12 months from Pontesford to the mines; since then these has been a good deal of illness amongst the men.

22,214. Amongst those employed in the smelting?—Yes, lead colic.

22,215. These works are at the mine?—They are, or at least within half a mile: a tramway runs from the mine down to them.

22,216. And the men working there are affected?—They are affected with lead colic. They used to be so at the smelting house at Pontesford occasionally. Since I came to Pontesbury there was one mine which was then the Gravels, and Grit, but which is now called the Roman Gravels. That company failed some years ago, that would be about 24 or 25 years ago. A good many of the men at that mine were affected with lead colic, and that is scarcely ever the case here.

22,217. (*Mr. Kendall.*) You mean at the mine itself and not at the smelting works?—Just so.

22,218. (*Mr. Holland.*) Were they near the smelting works?—No, they were eight miles from the smelting works, in fact there was no connexion with them at all; a good number of them had it at one particular time.

22,219. (*Chairman.*) Is that the case at present?—It is not that; that was at the White Grit mine, they were all one mine then but now they are two mines. No doubt it was owing to the work being dusty; it is very loose, and there was a good deal of carbonate of lead found at that time in the mine. They either inhaled it or they took it in from their fingers when eating, as they often take something to eat in the mines, and of course they have no means of washing themselves, or if they do wash themselves it is of course in water impregnated with lead.

22,220. (*Mr. Holland.*) They took it with their food?—No doubt of it, or they may have inhaled a little.

22,221. Has that ceased now?—Yes. I have not known anything of the kind for more than 20 years.

Capt. Thomas Henwood, Snailbeach Mine.

22,324. (*Chairman.*) Do the smelters reside in their own cottages near, or do they come from a distance?—They come from a distance, and have bed-rooms in the melting-house yard.

(B^{w}.)—MODE OF ACCESS AND EGRESS.

(B^{w}.) *Mode of Access and Egress.*

Capt. Edward Williams, Park Mines, &c.

20,011. (*Chairman.*) Do you think that in all mines where the men have to go by ladders it would be an improvement if they could have cages to go up and down?—Decidedly a very great improvement. We lose the labour of the best miners, that is to say the old tributers, in deep mines. They cannot go up and down the same as a young man, and generally speaking in the end of our own mine the old men have had to leave their work about an hour before the others, and then the young men, perhaps, would get up with them before they reached the top again.

20,012. (*Mr. Holland.*) What loss of effective power is there from climbing up and down say 200 yards?—I am sure that it is equal to half the stem of work for old men, and one fourth for young men; they would feel themselves more at their ease at their work if they did not climb, as they are used to their work.

Capt. James Raw, Cwm-Ystwith Mine.

21,568. (*Chairman.*) How do the men enter the mine—Mostly by levels.

21,569. What is your longest level?—I suppose the

(B^{w}.) *Mode of Access and Egress.*

longest level which we have is nearly half a mile, about 800 yards.

21,570. About how many other levels have you?—We have a great quantity of levels; I suppose we have something like eight or ten adit levels.

21,571. What is the greatest depth?—We are 40 fathoms below the bed of the river.

21,572. Do those levels all communicate?—They are all communicated one to another.

21,573. Where are you working principally now?—We are working in different levels; we are working from the adit level down to the 40 in different levels.

Capt. R. H. Vivian, Roman Gravels Mine.

22,554. (*Mr Holland.*) Have you any other objection to riding except the supposed danger of it?—I have no objection to it excepting from the danger, but I have no objection to riding in certain sorts of ways. I do not object to the Cornish plan of riding with a man-engine. I do not consider that dangerous; that is very good, but I mean riding in the skips, as they do in coal pits.

(B a^{w}.) *Ladders.*

(a^{w}.)—LADDERS.

Capt. Edward Williams, Park Mines, &c.

19,957. (*Chairman.*) In the old workings do the men go down by ladders?—Yes.

19,958. Do they go down the old workings principally, or any new workings?—They go down the new workings and the old; they go down the new shaft, and down to the deep level; the shaft is 86 yards deep.

Capt. John Floyd, Westminster Mine.

20,223. (*Mr. St. Aubyn.*) You do not think that the climbing is injurious to them?—No, because they are working in different levels; if the men all worked in the bottom of a deep shaft I think that skips would be advantageous.

20,224. Do you go much underground yourself now?—Yes.

20,225. To what depth do you go?—The bottom is about 120 fathoms from the surface.

20,226. Do you feel any inconvenience result from climbing?—Yes, compared with what I did when I was younger.

20,227. If you could come up by any other means than by the footways you would not feel the same amount of inconvenience?—No.

Capt. Joseph Ninnis, Maes-y-safn Mine.

20,405. (*Chairman.*) Do the men go down by ladders?—Yes.

Mr. Peter Parry.

20,492. (*Mr. Holland.*) Have you had accidents from falling from the ladders?—Yes, at Talargoch and other places.

Mr. Thomas Roberts, Rhosesmawr Mine.

20,629. (*Mr. Kendall.*) Is there any division in that shaft which the men come up, or do they come up in the same shaft without any partition?—There is no partition.

20,630. So that there is no division between the ladders by which the men come up in that shaft and the engine?—No, I do not think there is. They generally go by the other shaft, that is to say, the footway shaft.

20,631. (*Mr. Holland.*) But they go by the engine shaft sometimes?—Yes.

Capt. Francis Evans, Bryngwiog Mines, &c.

20,656. (*Sir P. Grey Egerton.*) How do the miners get access to these workings?—By means of a footway furnished with ladders.

20,657. Are the ladders very steep?—No; they are on the vein generally speaking; there is an underlay of about two feet in a fathom.

20,658. Are they wood or iron?—Iron and wood. We put in iron staves every new one that we make.

20,659. Are these the old ladders which you purchased with the rest of the plant, or are they new ladders?—Some of them are old ladders which we found in the mine.

20,660. Do you find that these old ladders are serviceable?—They do very well till the staves get worn out, and then we put in iron ones.

20,661. Then where there is any appearance of a stave being unsafe, you replace it?—We replace it directly.

(B a^{w}.) *Ladders.*

James Goddard.

20,692. (*Mr. Kendall.*) As I understand, you have no stage or resting place from the surface till you get to the bottom of your mine?—No.

20,693. What is the depth?—120 feet.

20,694. Then you have to go up and down 120 feet without resting?—Yes.

20,695. Have you ever had any accident?—Never.

20,696. The ladders are all safe and tight?—Yes.

20,697. Where were the ladders made?—In Halkin.

20,698. Do you find it fatiguing to go that depth without stopping?—No, I think not.

20,699. Do you ever buy a second ladder?—No.

Mr. Richard Lewis Parry.

21,380. (*Mr. Holland.*) Have they complained of excessive fatigue from climbing?—No, I have not heard them complain much about that.

21,381. Do you think that there is any ground of complaint of that sort here?—I think that taking the construction altogether, it is anything but what it ought to be.

21,382. In what respect?—In timber for supporting the shafts and in coming upon the surface they get into rather a rotten state, and they do not look after them properly.

21,383. Do you consider them dangerous?—Accidents occur.

Mr. William Henry Paull, Goginan Mine.

22,098. (*Chairman.*) Do the men prefer coming down the incline to climbing?—Yes.

22,099. About what distance have they to walk underground from the end of the incline?—About three quarters of a mile.

22,100. (*Mr. Holland.*) And how much would the climbing be?—It is 120 fathoms.

22,101. They prefer walking three quarters of a mile underground to climbing 120 fathoms?—They do.

22,102. (*Sir P. Grey Egerton.*) What is the height of the levels?—They are 8 feet high and 5 feet wide.

22,103. (*Mr. Kendall.*) Do the men adopt that course to avoid climbing or to bring them nearer to their homes?—To bring them nearer to their homes.

Capt. Thomas Henwood, Snailbeach Mine.

22,366. (*Mr. Holland.*) Below what level are your main workings?—Our principal workings are below the 252 yards level.

22,367. Then the majority of your miners climb 100 fathoms?—Yes.

22,368. Your miners have very much more climbing than the Fowey Consols miners have?—Yes. They have a man-engine now at the Fowey Consols.

22,369. Had they a man-engine there in your time?—Yes, and there has been a man-engine spoken of here. The men climb faster in Cornwall than they do here.

22,370. Does climbing 100 fathoms hurt a healthy man if he climbs slowly enough?—It is very laborious work; I should think that it would hurt him more or less.

22,371. How much of his day's work does it take out of a miner to climb 100 fathoms; does it take out as much as one third; how long would it take him to go up and down 100 fathoms?—Perhaps 50 minutes.

22,372. How much ordinary work is that climbing equal to; is it equal to as much as three hours?—It is fully equal to one hour and a half.

Samuel Jones, Snailbeach Mine.

22,432. (*Mr. Holland.*) About how much time does it occupy you in going up and down?—It occupies us an hour and a half.

22,433. That is about 60 minutes coming up and 30 minutes going down?—Yes.

22,434. That is very hard work, of course?—Yes, it is hard work to come up; we can go down middling.

22,435. Does it take as much out of you as two hours' work in the mine?—Yes, when we come up fast; it is easier a good deal to work for a longer time than it is to climb for an hour.

22,436. Does it make you sweat very much?—Yes, to climb up.

22,437. You are in a great sweat when you come up to the top?—Yes.

Capt. Richard H. Vivian, Roman Gravels Mine.

22,545. (*Mr. Holland.*) Does 190 fathoms climbing not hurt a healthy man?—Certainly, to a certain extent, but I think nothing to equal the working in bad air and in places which are not properly ventilated; it is the

(B^{w}.)—MODE OF ACCESS AND EGRESS.

working that does the harm, and of course the climbing in the deep levels in Cornwall must be injurious as well; but I would rather climb than ride at any time.

22,546. Why?—Because there are so many accidents, and you cannot warrant a chain or any other machinery, because sometimes they are put up to test, and they may have been tried, and another party may have broken them.

22,547. (*Chairman.*) Have you ever been in a coal mine?—No.

22,548. Are there no accidents from falling away from the ladders?—Yes, there have been some, but nothing to compare with accidents from riding up and down the shafts.

22,549. How do you judge of that?—We see so much of accidents in the papers in coal districts every week; and in lead and copper and tin mines we seldom see of accidents of any men falling away.

22,550. Are the accidents put into the public prints, when men fall away from the ladders?—Yes. I have had relations of mine who have fallen away, and it has been put into the papers.

22,551. Do you think that it is always put into the papers?—I cannot be bound to say that.

22,552. Where were these relations of yours?—In Cornwall, near Camborne. I am a native of Camborne.

(B *a*^{w}.) *La ders.*

(*c*^{w}.)—SKIP.

(B *c*^{w}.) *Ski*

Capt. John Floyd, Westminster Mine.

20,228. (*Mr. St. Aubyn.*) Therefore, in your opinion, it would be a good thing to have some other method of ascending?—It would be an advantage to come up by skip instead of climbing.

20,229. Has that ever been suggested here?—I do not know that it has, because no mines are worked to a great depth here excepting such as the old Minera Mine; the mines generally in this neighbourhood are rather shallow.

20,230. You do not consider that a depth of 100 fathoms is so great as to induce the managers to bring the men up in skips rather than by the footways?—To bring them up by a skip a plim shaft would be more convenient and the shafts here generally go down with an underlay according to the vein.

20,231. But skips can be used in a diagonal shaft?—Yes.

(C^{w}.)—VENTILATION.

(C^{w}.) *Ve tion.*

Capt. John Darlington, Minera Mine.

19,856. (*Chairman.*) Do you use any artificial means of ventilation?—No; there is no mine in the world which is better ventilated, I should think.

19,857. So that you do not require any artificial means of ventilation?—We do not.

19,858. How far do you think you could drive an end from any winze or shaft?—We have driven as much as 160 yards; but generally speaking I should not think more than from 80 to 90 yards.

19,859. When you were driving 160 yards, how long did the powder smoke hang there?—I should think that it might be two hours.

19,860. Did you use any artificial means of ventilation when you were driving the 160 yards?—We had a fan.

19,861. How was it worked?—By what they call in Cornwall a duck machine. It is two boxes; one box working in water.

19,862. (*Mr. Holland.*) You mean Taylor's duck machine?—Yes.

19,863. (*Mr. Kendall.*) Are you a Cornishman?—Yes.

19,864. (*Chairman.*) Was it attached to the engine?—No, it was worked by manual labour; a boy worked it.

19,865. In what kind of pipes was the air taken?—Our pipes were about 5½ inches. We have had wooden pipes, but we now use zinc pipes; there does not appear to be so much friction in the zinc pipes. There is perhaps no mine in the kingdom in a stratified district which is freer from the carbonic acid gas than this mine is.

19,866. Do the men go in immediately after firing?—Perhaps in about a quarter of an hour.

19,867. What is the longest distance which you are now driving from any winze?—90 yards.

19,868. Have you any artificial means of ventilation there?—No. I am very much surprised to find how it is. I can hardly account for it.

19,869. Do you know how long the smoke hangs there?—I should thing that it is about the same time.

19,870. Do the candles burn well there?—Capitally.

19,871. Have you never any complaints?—Never.

19,872. Do you think that there are any crevices in the rock or any swallows?—In some of the caverns, which you will find in the limestone district throughout the kingdom and throughout the world, there is generally contained some carbonic acid gas, and as soon as it is let free, of course it is heavier than the common atmosphere, but at the same time we get rid of it almost immediately. We have an immense current of air through our mines.

19,935. (*Mr. Holland.*) What stone do you work in in your mine?—Limestone. We have a great deal of the siliceous stone.

19,936. Chirt?—Yes.

19,937. Is there any marked difference between the men who work in limestone and the men who work in chirt?—Yes. I would rather do work in what is called the mountain limestone; there certainly is better air in the mountain limestone or the carboniferous limestone; ours is carboniferous limestone. There is better air in the compact mountain limestone or the carboniferous limestone than in the chirt or the shale. There is always some carbonic acid lurking about in the shale and in the chirt.

Capt. Edward Williams, Park Mines, &c.

19,946. (*Chairman.*) Do you find that the carrying of the two levels by a division gives perfect ventilation?—Yes, in the adit level it does so; it will clear away the smoke of perhaps five or six blasts at the same time, in about three or four minutes.

19,960. (*Mr. Kendall.*) At present you are not doing much in the way of raising lead?—No.

19,961. You are hampered by water?—Yes.

19,962. By a large river which passes underground in the Park mine?—Yes.

19,963. What are you now doing in order to get rid of that water?—We are driving a deep adit level.

19,964. How much deeper will that adit level come under the old workings?—30 fathoms.

19,965. You have rich ore, but cannot follow it on account of the water?—Yes; the best ore lies about 4 feet wide.

19,966. How many fathoms will you drive before you cut the vein?—We have to drive about 230 yards before we shall reach the average line of it.

19,967. How far have you gone at present?—We are nearly 1,100 yards from the mouth of the adit.

19,968. Between the 1,100 yards and the adit end have you any shaft?—Yes.

19,969. How far back from the adit end have you a shaft?—A little more than 550 yards.

19,970. Are the men working in good air there now?—Yes.

19,971. How was that effected?—By means of a wall 2 feet of air-way is left by the side of the level.

19,972. What is the size of your level?—At 7 feet 3 inches wide, and 6½ feet high.

19,973. And you have a partition of what?—Of stone and brick.

19,974. Is it air-tight?—Yes.

19,975. You have a trap door near the shaft?—Yes, the passage of the shaft is closed.

19,976. Then the air goes in from the adit end?—Yes.

19,977. To the very end?—Yes.

19,978. It comes round the division and up the shaft?—Yes, the tramway is closed at the shaft; there is no way for it to get back again.

19,979. Is the air perfect in the end?—Yes, quite.

19,980. How many men have you working in that end?—12; they are now working 6 hours, three at a time in the end.

19,981. Is that as many as can work?—No, we could put another man there.

19,982. Why do you not put another man there?—We find that the 12 men drive just as much as the 16.

19,983. It is not on account of the air?—No, it is from the room for working.

19,984. Do you find that sometimes there is a difference in the air in the end, that it is at one time hotter than another?—Very seldom in that end; the current is very strong.

19,985. Suppose you omit to carry up your division pretty close, do you not find a difference at once?—Yes, no doubt of it, if it is left more than about 20 yards behind the end we find a difference; we must not bring it too near the end or the current would be too strong. The men could not stop there, it would be too cold.

19,986. (*Mr. Holland.*) It would blow their lights out?—Yes, and the blast would break down the wall.

19,987. Would it inconvenience them in any other way except in putting the lights out?—Yes; they would have to check it in some way, and the air would be very cold. We intended to put a donkey on the level to draw the stuff from the end, but we think that it would not live there; that it would be too cold.

20,007. (*Mr. Leveson Gower.*) Is the system of ventilation by a partition adopted in any other works that you know of?—I do not know any other case except in this level.

20,008. (*Mr Kendall.*) What induced you to adopt it?—It has been done for the last 50 years.

20,009. Where?—In this very level.

20,010. Do you think that you shall be able to carry out the whole length in the same way?—Yes, I believe that we could go on for two or three miles if we wished.

20,013. (*Chairman.*) Do you know any case where men have lost their lives in air where the candle has been found to burn?—Yes, in the Bryngwyn Mine, near Mold, six men lost their lives, and the candle was found burning within about ten yards of the men.

20,014. (*Mr. Kendall.*) Were the men nearer the end than the candles?—Yes, they were between the end and the candles.

20,015. (*Mr. St Aubyn.*) What did those men die from?—I do not remember what the verdict was, although I have read it; they were suffocated.

20,016. This is only what you have heard?—Yes. The coroner at Mold could give the particulars.

Capt. Sampson Michell, Park Mine, &c.

20,026. (*Chairman.*) How long does the powder smoke remain in any place where you consider the ventilation deficient?—From an hour to an hour and a half.

20,027. And how long where it is good ventilation?—It goes off in about two or three minutes where the ventilation is very good.

20,028. How far would you drive from any winze or shaft without any artificial means of ventilation?—We drive from 160 to 200 yards; we have done that without artificial means.

20,029. What is the artificial means which you would use in that case?—A fan, a duck machine, a waterfall, or partition wall.

20,030. In any of the smaller mines do you find any difference in the ventilation from the larger mines?—The deeper the mines are the worse the ventilation is.

20,031. Does not it depend upon the distance from any means of ventilation?—It rather depends upon the distance, but the deeper we go down the warmer it gets.

20,032. (*Mr Kendall.*) You do not doubt, as I understand you, that if you carry on the division and make it air-tight, you will be able to go through the whole length?—Yes.

20,033. What will be the whole length before you cut the vein?—About 230 yards additional to what is already done.

20,034. You think that you will have sufficient draught by this division without any artificial means?—Yes, if we keep it air-tight.

20,035. (*Chairman.*) Is the draught of the current of air always the same way along the two divisions?—I have found it different.

20,036. Is it, do you think, affected by the weather?—I fancy that it is.

20,037. Is there a period when it is more stagnant than at other times?—It is a little in warm weather.

20,038. Whether it be a downcast or an upcast, is the air in the end very good?—Yes.

20,039. (*Mr. Holland.*) Does the direction of the wind affect the current?—Yes, it does.

20,040. Have you noticed that with any regularity?—I have not taken particular notice of it, but I should fancy that it would; that when the is wind east it would be more likely to go in at the mouth of the level.

20,041. The adit points east?—Yes, and it comes out at the top of the shaft.

20,042. Does hot weather alter it?—Yes, a little.

20,043. Does it ever make it stagnant?—No, I do not know that it makes it bad at all in this level, but it alters it in the workings on the hill. I have heard no complaint from the men in that level as to the badness of the air.

Capt. John Floyd, Westminster Mine.

20,259. (*Mr. Kendall.*) Have you any close end where you are obliged to use a fan?—No, not at present.

20,260. Have you any end where the candles burn dull?—No; the candles burn well everywhere.

20,261. You say "not at present;" have you ever had such an end in the last twelve months?—No, not in the last twelve months.

20,262. In the last two years?—Yes.

20,263. Where was it; in what level?—It would be about 90 fathoms from the surface.

20,264. How far off from a shaft was it?—That end was continued, but we have had rises from there up to another level.

20.265. When the air was bad, how far off was it from any shaft; I mean before you holed?—Before we holed it was 50 fathoms from a shaft, then we sank and rose to meet, and then we had plenty of air, but before that the air was flat.

20,266 Before you holed was the air bad both in sinking and in rising?—Before holed the air was rather dead.

20,267. In the deadest time, how many men could you put there?—It only requires two men in the 8 hours each piece, 6 men in 24 hours.

20,268. Had you six men altogether?—We had two men working there and two men in the roof working eight hours, and when the air was very flat we only put them six hours.

20,269. Was the air ever so bad that they could not work six hours?—No.

20,270. Were the candles ever dull there?—The candles always burn dull when the air is flat.

20,271. Did you use any fan at all?—Yes

20,272. Did that give you a good supply of air?—Yes, there was plenty of air.

20,305. (*Mr. Holland.*) How long does the powder smoke generally hang about in your levels?—It is according to the air.

20,310. And is the quantity of air passing through them much about the same?—Yes; but I think the Cornish mines are generally warmer than here.

Capt. Joseph Ninnis, Maes-y-safn Mine.

20,429. (*Mr. St. Aubyn.*) Are the mines here better ventilated than they are in Cornwall?—They are equally as good here.

20,430. Not better?—No, I do not say that they are; it depends upon the management of the mines in Cornwall. Where there is pretty good management there is pretty good ventilation. Where the management is defective the ventilation is defective

20,431. Is the management better here generally than it is in Cornwall?—It is just the same.

20,450. (*Mr. Kendall.*) Did you ever see a candle go out in shale; did you ever see a candle go out in any of your mines here?—No; I have seen it in Cornwall, but not here. Men now work in our mines who are upwards of 70 years of age, and who have worked in Maes-y-safn Mine all their days.

20,464. At that time the mine was in a very bad state as far as ventilation went?—No.

20,465. The old miners followed the ore wherever they could?—Yes; they went down in the bottoms.

20,466. Without regard to ventilation or anything else?—They had pretty good ventilation, because the bottom was open and they had a railroad right in the middle of the workings: the ventilation was as good as it is now.

20,467. The ventilation was good, but then the woodwork and things of that kind were in bad order?—Yes.

20,468. Since you have been here your ventilation has been pretty good, except just before holing?—Yes.

20,469. Before holing have you ever had it so bad

(C^{w}.) *Ventilation.*

that you have been obliged to put the men to work short stems?—Never.

20,470. Now you can work 16 hours out of the 24?—Yes, pretty well.

20,471. Sometimes you only work eight hours?—Yes.

20,472. Do you not think it worth your while before holing now and then to have a fan?—I do not know; the air is only bad for a short time, and then it is not very bad; it is fairish air for underground. I have seen ten times worse air; I do not think that the air is injurious at present.

20,473. The men do not complain?—Not at all.

20,474. And they do not seem to suffer?—They do not.

20,475. The candles burn brightly?—The candles burn quite upright. In a month or two more we shall hole.

20,476. How many fathoms do you drive off from an air hole before you begin to feel a difference, as far as the candle goes, generally speaking?—The candle will burn very well for 30 fathoms, but after that it gets very flat.

20,477. How long is it before it begins to show a difference—ten fathoms?—Yes.

20,478. As a fan is not an expensive instrument, might it not be an economy to use a fan the moment you find a difference in the candle?—I think that the best way would be when we get the mine in a proper course of working to keep air sollers, that is the best ventilation, that is always drawing, but a boy does not work.

20,479. Do you not think that the moment the air begins to get a little dull you ought to have either a soller or a boy; would not that be economy?—Yes; a soller would be the best.

20,480. (*Sir P. Grey Egerton.*) Would it not pay you to get rid of the smoke in a shorter time out of that end?—I do not think that we could get more work done.

Capt. Francis Evans, Bryngwiog Mine.

20,542. (*Chairman.*) Where you are sinking have you any artificial means for providing air?—None at all, except in many cases from the different levels. We always take care to have winzes sunk in advance of the levels so as to get down by the time the levels reach them; we sink the winzes before the driving so that when the driving comes up underneath them we communicate. We consider 20 fathoms, generally speaking, far enough.

20,543. You would not recommend driving a level further than 20 fathoms?—No; you cannot ventilate the bottom of a mine sufficiently unless you do that; that I believe is the system generally adopted in Cornwall, and that is what I carry out here.

20,544. Have you no deficiency of air?—No, except in very hot weather in the summer, and I think that that occurs almost everywhere whether shallow or deep, from what I have seen.

20,545. It does not depend upon the depth of the mine?—No, but upon the atmosphere.

20,566. (*Mr. Kendall.*) Do you think that the air in the 90 fathoms here is purer than in 90 fathoms in Cornwall?—I think it is.

20,567. Do you know why; is it from the difference in the strata or not?—It is particularly as to copper mines; the air in copper mines is hotter. In tin mines I think it is just the same as it is here; just the same as in lead mines, except that in the shallow mines here the air is very bad, but they are not worked on the vein, they are worked on what they call flats, beds; and then the stratification is different, it is more of a clay and sand and soil.

20,568. And that is bad?—It is.

20,574. Can you speak of the air in the neighbourhood of shale?—Those flats are not so easily ventilated, because the levels have to be driven almost horizontally.

20,575. Do you think that any gases come out?—I have never proved it.

Mr. Thomas Roberts, Rhosesmawr Mine.

20,595. (*Mr. Kendall.*) How is the air in your mine?—Very good; there is plenty of air.

20,596. Have you any bad air in the 100-yards level west, in the end?—Yes. We have stopped that. The object of it was to make a day level. We went many yards, and then stopped it; there was no ore in it.

20,597. How far off from the west whim shaft have you gone?—I suppose it is nearly 100 yards.

20,598. You went about 100 yards, and the air was bad?—Yes; and it was very hard. We were driving this to meet the level.

20,599. You found the air bad, and the end hard?—Yes.

20,600. Do you recollect how many pounds you were giving a yard when you stopped?—5*l.* 10*s.*; another was 6*l.* That was in October last.

20,601. Did you use any artificial means of throwing in air, any fan machine?—No.

20,602. How many men worked in the west end during the 14 hours?—Only six. It was standing from 12 at night till 6 in the morning; there were six hours that they were not working.

20,603. But even with that the air was bad?—Yes, very bad. We found that there was no sign of commencing the day level.

Mr. James Goddard.

20,700. (*Mr. Kendall.*) How is the air at the bottom of your mine?—Very good indeed.

20,701. You have a funnel at the top, and it is found to be good all the way down?—Yes.

20,702. How far from the bottom of the shaft is the end?—About 10 yards.

20,703. How many ends are you driving?—Only one.

20,704. On the course of the lode?—Yes, west.

20,705. Does your candle burn well?—Yes, capitally.

20,706. And I suppose you turn your funnel against the wind?—Yes; it will turn in a minute.

20,707. If it is a very calm day, with no air at all, do you find any difference then?—Yes, a little; not much.

Mr. James Williams.

20,820. (*Mr. St. Aubyn.*) You have spoken of the men complaining to you that they have been obliged to work in places where the candle would not burn?—Yes.

20,821. Is that a frequent complaint?—Yes. I spoke to half a dozen different men a few days ago, in different parts of the district, and they said the same thing, that they had frequently worked where the candle would only just burn and give light.

20,822. Did they say that they were obliged to work in such places?—That they went on working.

20,823. Where the candle went out or where it burnt badly?—Where it scarcely gave any light.

20,824. Was this in the Halkin district?—Yes, Halkin and Ysceifiog.

20,825. Did you gather from what the men told you that the overlookers were aware of the fact?—Yes; but I believe that it is a custom of the country, and I do not believe that the men think much about it; they seem to look upon it as a thing to be done.

20,826. It is a common practice?—Yes, decidedly, from what I hear.

Capt. William Bowen, Talargoch Mine.

20,910. (*Mr. Kendall.*) When you get near the coal here, have you not some gases sometimes?—Yes, there is some gas at the western end, it smells a little obnoxious in this level, but the other part of the mine is quite sweet.

20,911. Do the men complain much of it?—Sometimes when it happens to come very strong.

20,912. Do they leave work or no?—No, they get air; we drive and sink sumpts to get air on the levels.

20,913. Before you completely get a thorough draught, of course they must suffer for some time; how do you manage then?—They cannot suffer but very little.

20,914. Why?—Because we have pipes and water falls.

20,915. When you find the air becoming close you have recourse to fans or water jets?—Yes.

20,916. Which do you use most?—We prefer water as it is more regular.

20,917. Taking an end where there is no gas, and an end where there is gas, how far in the end where there is no gas do you generally drive without having recourse to a water fall?—30, 40, 60, or 100 yards.

20,918. Do you find that you can go as much as 40 and 50 and 60 yards without inconvenience?—In some places you may go to 100 yards, and in another place you could not go 40 yards.

20,919. Can you account for the difference?—I cannot

20,920. Can you go as far in shale as you can in lime?—No.

20,921. The moment you find that there is the least close air from whatever it may arise, you at once have these appliances?—As quickly as possible always, we make a preparation for it before they have to complain

20,922. How do you ascertain when it is close; what makes you find it out?—It will begin to feel warm and get more difficult; the candle will show in a moment if it is not good.

20,923. Is the candle your principal guide?—That and the smell; you can tell by the smell in a moment.

20,924. That is where there is gas?—Yes; and before there is gas, if the air is getting short you can tell by the smell as well as anything.

20,925 There is a closeness?—Yes.

20,926. Can you tell by the smell before the candle will guide you?—Yes; the smell will be unpleasant.

20,927. And injurious?—There is no doubt about that.

20,928. You can tell the smell when there is no gas?—Yes.

20,929. You also of course can tell it when there is gas; that is another kind of smell?—Yes I could not tell the difference by the smell of fire-damp gas. I could not tell that it was fire-damp gas or what gas it was, but I should know that there was some kind of gas which ought not to be there.

20,930. You cannot distinguish between the different gases, but you are satisfied in your own mind that there is a certain gas there which is injurious?—Yes.

20,931 But apart from all these gases you think that in some parts of the east end where there are no gases you can distinguish before the candle will show that there is close air?—Yes.

20,932 You cannot describe what sort of smell it is?—No, it is impossible

20,933. But it is a peculiar smell?—Yes.

20,934. You do not smell anything like it above ground?—No.

20,935 When you are talking of the close air which you can smell, does that arise from powder blast?—No, it may be in a place where you do not use powder at all, but as for the powder smoke I do not mind so much about that, that is not so injurious as the bad air; any person can tell when he gets into a fore-breast if it is beginning to get a little close, and especially if he is accustomed to go down.

20,936. (*Mr. Leveson Gower*) He can tell from the smell and not from the difficulty of breathing?—It is not from the difficulty of breathing, for I have been working myself and I have been three or four months before we had any apparatus to blow, in mines where I have been in. I have told the captain, "There is beginning to get a little smell, we shall be short of air very soon." He has said, "We will make preparations and have air quickly."

20,937. (*Mr.. Kendall.*) As I understand, the moment you anticipate any difficulty at all with regard to air you have your appliances all ready?—Yes.

20,938. Are those appliances expensive or not?—Sometimes they are very expensive.

20,939. Take your 140 yards level; supposing you are near a shaft, and you want to put an apparatus near the shaft, and want to blow 40 yards, what will it cost you?—It will take from 30*l.* to 40*l.*, I have no doubt, with timber and sawing and nails, and putting them in their places, and everything. It is just according to the size that you make the pipes For 40 yards only it would not cost so much as that, but you would get three or four baulks, and cut them up to make air pipes. It is according to the size and thickness and strength of the air pipes. You would get very little timber for 15*l.* or 16*l.*, and then there is the trouble of sawing them, and measuring them, and putting them up in their places. They will not go very far.

20,940. Will it cost from 25*l.* to 30*l.*?—No, I should think not. All the timber would not go for that purpose. The cost would be reduced by using them in other places

20,941. The cost would be reduced, inasmuch as when a communication was made, you could apply the wood for other purposes?—Yes.

20,942 The actual fan itself, and I suppose the box for the water jet, and so on, could be conveyed elsewhere?—Yes.

20,943. Do you ever use zinc instead of wood?—No, we have had no zinc here. We did not get the pipes large enough We had some four-inch pipes, but we have been taking them away, and putting in some eight-inch pipes

20,944 You think that an eight or ten inch square wooden soller or pipe is better than a four-inch iron pipe?—Yes, better than three four-inch iron pipes. Iron pipes would be better, if you had a great pressure of air to force upon them, on account of their strength; but if you want air to go quickly with a slight pressure, the larger the pipe the better.

20,955. The mine, speaking generally, is very well ventilated?—Very well. I can safely say that it will be the best in England if we have a cross driven south; that is the only difficult place which there is; it will be through in a very short time.

20,956 (*Chairman.*) When you meet with gas how does it affect the men?—It is a little sharp on the eye, the same as if you were peeling onions or something of that kind.

20,957 (*Mr. Leveson Gower.*) Is the candle ever affected from bad air without your perceiving any smell at all?—We perceive the smell before it shows upon the candle.

20,958. You always do so?—Yes; unless it is from a man's carelessness that he does not take notice of it; it is plain enough to be observed.

20,959. Is the candle ever affected by bad air without your perceiving any difference in the smell?—No, I have never had it so; it is impossible that the air can be good in every place although the candle burns.

20,960. (*Mr Kendall.*) Did you ever see the candle burning badly without your smelling at the same time that the air was bad?—No.

20,961. (*Mr. Leveson Gower.*) Then the candle is of no use as showing the badness of the air, because you can always smell it without?—You can smell the commencement of it before it takes effect upon the candle. I have worked in several places where the air has been very bad, and the candle would burn very well, and we could do our work very well.

20,987. (*Sir P. Grey Egerton*) You have stated that your artificial ventilation is by means either of fans or of water falls?—Yes, when it is required, but it is very seldom required

20,988. But when you use artificial ventilation, you use either fans or water falls?—Yes.

20,989. Do you find that very expensive?—The water falls are not so very expensive, there is only the expense of making the air pipes.

20,990. Did you ever try ventilation by means of a furnace?—No, we could not get it to act here.

20,991. Why do you think it would not act?—Because it is not like a colliery, the air would be tumbling up and down first one way and then another, and perhaps it would kill all the men in the mine.

20,992. Is the upcast always upcast and the downcast always downcast?—No, it changes perhaps six or eight times in a day sometimes.

20,993. Then according to that a furnace would not be more variable in its action than your present ventilation?—I do not think that a furnace would act at all unless we had only two shafts to keep the current regular.

20,994. You have never tried it, at all events?—No, we never had any occasion to try it.

Mr. Edwin Aspinall Beach, Coed Mawr Pool Mine.

21,025. (*Chairman.*) Supposing the men were working where there was bad ventilation, you would not interfere with it?—No. We never have any complaint as to ventilation.

21,026. Then all that you look to is the royalty?—Yes

21,027. The object with you is money?—Certainly.

21,028. And, provided a good royalty is paid, that is all you care about?—Certainly.

Capt. Matthew Wasley, Coed Mawr Pool Mine.

21,043. (*Chairman.*) When you came here was the ventilation good?—No.

21,044. Where was it had?—It was bad at the shaft called No. 2, and they went to the 15 fathoms and extended the levels, and there was only one shaft.

21,045. How far did they extend the 15 fathoms from that shaft?—About 30 or 40 fathoms.

21,046. Had they any jet of water or any air pipes at all?—No, there was no jet of water then.

21,047. Did you ascertain at that time that there never had been any use at all of jets or fans?—They had fans; we have the same fans here now.

21,048. After you came here you soon had a communication?—Yes; we had a shaft sunk from the surface.

21,049. At once?—Yes.

21,050. From that time to this have you had any bad air?—No; the air is very good

21,051. What is the furthest end?—The 28 fathoms is our bottom level.

21,052. Are you driving from a sumpt shaft?—Yes. We are not two fathoms off from a winze.

21,053. How far are you off from a shaft?—About 10 or 12 fathoms. We are driving a cross cut from the engine shaft about seven fathoms. We cut the lode and we put a winze on the course of the lode; that is just as we came in.

21,063. You are perfectly satisfied that your ventilation is good from beginning to end?—Quite so.

21,111. (*Mr. Leveson Gower.*) I understood you to say that the ventilation is better now than it was when you came here?—It is better now that we have two shafts open than when I came. I believe that the reason why they worked so contracted in their shafts was that this was a lake of water some years ago, and they went to a great expense previously to my coming here, and let the water off that lake. That is supposed to be the reason why they were so contracted in their shafts and openings. They were almost afraid to open anywhere previously to letting off the water from the lake.

21,112. Do you see any improvement in the health of the men, since you have been here, from improved ventilation?—When I went underground they were stoping in the roof at the 15 fathoms; they were down to the 15 fathoms, and I thought that the air seemed rather of a sleepy and stupid nature. I said, "Where is your ventilation?" and they pointed out to me what they were doing in order to arrive at a certain point of ventilation. That was in Mr. Plumer's day; he was about to leave. I came in June; in July we sank a shaft which gave us ventilation, and we put a footway. I came here on the 2d of June, and early in July we had a new shaft sunk from the surface, which gave new ventilation. That is all I know about the matter relative to the air being close. If that state of things had continued they would have been unhealthy of course. The men were looking rather stupid in the eyes; I know what bad air is, I can smell it.

21,113. Do you know anything about the state of the ventilation in the smaller mines in the neighbourhood? No. I work at another mine and our ventilation is good there. We are in about 15 fathoms, that is all at present, and another shaft is coming down from the surface now for ventilation.

21,114. You do not know of any case of bad ventilation in the neighbourhood?—I do not know any that I can name.

21,115. (*Chairman.*) You say that you can smell the bad air. Can you, from your experience as a miner, which I have no doubt is very great, smell bad air before the candle begins to flicker and to burn dull?—Yes. A practical man can smell the air, and tell that it is injurious.

21,116. Before the candle begins to show it?—Yes. A man will live for many hours where a candle will not live at all; a man can work in the dark.

21,117. Did you ever work in the dark yourself?—A little.

21,118. Upon a good pitch?—Upon a good pitch.

21,119. When you were a tributer, whenever you found the candle failing have you been so anxious to work that you have worked beyond your candle?—Yes. I have kept the candle behind. I have let it incline till it would run itself quite out, and then of course you must give up.

21,120. You felt that the air was very bad?—Yes. You can smell it and feel it.

20,121. How often have you done that in your lifetime?—Not much.

21,122. It is dangerous work?—It is very dangerous work, and I have done very little of it. I always fly from hot places.

21,123. (*Mr. Holland.*) Could you work fairly in such air as that?—No.

21,124. Could you do half work?—No.

21,125. (*Mr. St. Aubyn.*) Do you ever find the candle burn badly here?—No, except it is in a particular place, just before you hole a piece of ground, but not to continue. Our general working is in good air, the place being so shallow, we only being 28 fathoms down from the surface.

21,126. Generally speaking, you can always hold the candle upright?—Yes.

21,132. (*Mr. Holland.*) What ventilating machines have you used here?—The fan and wooden pipes.

21,133. And a duck engine?—Yes, we have that now.

21,134. And a water blast?—We had a water fall for a little while over at the engine, and it worked very well; and we had a duck machine, or rather a large piston, which worked with the engine.

21,135. Which did you like best?—The piston with the engine worked very well, but there is nothing to beat the water blast.

21,136. Did you put in the ventilating machine before you wanted air to make the candles burn?—Yes. In fact we were aware that we must have it sooner or later.

21,137. Do you put it in before the candles show a want of air?—There may be a dullness in the smoke leaving the place after a blast. There seems to be a kind of cloud in the blast, and then we use it because the peat and clay lies very heavy in this valley. When we found the smoke to lie, though the candle burnt pretty fair we put in this piston with the engine.

21,138. Then before you wanted it to make the candles burn you put it in to clear away the smoke?—Yes.

21,139. Do you perceive the bad air take the strength out of you before the candles show it?—Yes, it will take the strength out of any person; a man will lose the power of his body before the candle shows it.

Capt. William Vivian, Parys Mine.

21,154. (*Chairman.*) Do you use any artificial means of ventilation?—Occasionally, but not at present. We use a fan machine, if in sinking a winze or sumpt the air is not as it should be, but I do not know that there is one at present in operation in the mine.

21,179. (*Mr. Holland.*) Do you consider yours a well-ventilated mine?—Yes, exceedingly well-ventilated.

21,180. Have you any place where the candles will not burn freely?—No, I do not know any, there was one end rather close, but the candles would burn upright there.

21,181. How long does the powder smoke hang there?—It may be for an hour or two after a blast.

21,182. Is it very unusual for it to hang as long as that?—No; that is about what it generally is. It does not clear off unless it is well ventilated by a winze, it will then clear off in a few minutes.

21,183. Is it general in many parts of the mine for powder smoke to hang as long as an hour?—No, that was a long distance from a winze.

21,184. It was an exceptional case?—Yes.

21,187. (*Mr. Kendall.*) At the 112 fathoms level going from Gwen shaft towwrds Dyer's shaft, going east, you must have had about 35 fathoms before you made any communication?—Yes, we had.

21,188. Did you use any artificial means of ventilation there?—No artificial means whatever, but we had a very large level; we have very fine levels.

21,189. What is the size of your levels?—Nominally 7 feet by 5 feet; but I believe they are more than that generally.

21,190. Have you any brattice of any kind?—No.

21,191. You have nothing but the simple level?—Just so.

21,192. And you only find inconvenience in blasting?—Yes; that level is communicated now.

21,193. How many men have you working in that end?—Six.

21,194. Do they relieve every eight hours?—Yes.

21,195. Do they relieve in place?—Nominally.

21,196. Do the candles always burn well there?—Yes.

21,197. The men never complain?—I never heard them do so. The only difficulty in ventilation in this mine is during a few days in the most sultry weather in the summer; there is a peculiarity about that, and it

(C^{w}.) *Ventilation.*

has occurred since Lord Kinnaird was here and underground, in the few hot days of last week; and to remedy that we threw water down from the 65 fathoms level through one of the shafts (we have full engine power now); we made a first rate water fall and cleared all the levels.

21,198 How soon were the levels cleared?—Almost instantly; it agitated the whole air of the mine.

21,199. (*Mr. Holland.*) Did it make a perceptible draught up the up-cast shaft?—I was not present when it was done in the evening; they cleared it all out, so that the men had no complaint afterwards whatever.

21,200. (*Mr. Kendall.*) There was almost an instantaneous change?—Quite so.

21,201. Have you had many drifts of 35 fathoms in that way?—No, that was about the longest reach in the lower part of the mine that we have had; it was poor ground.

21,202. I see that from a cross-cut at a 45-fathoms level you drove part of the way on the lode going west, and then came into a sort of cross-cut again; you lost your lode, and then it appears as if you had a bit of lode again and then you made an angle, having driven 60 fathoms; you made a turn almost at right angles and went 20 fathoms more, you then made another angle and went 60 fathoms more, that is 140 fathoms from any air communication?—Yes.

21,203. Had you any fan there?—No artificial means of ventilation whatever, and the candles will burn in the present end as well as they will in this room.

21,204 Through what did you go?—Through slate rock entirely.

21,205. Had you any cracks in the slate?—Nothing to name, only structural seams or cleavage lines.

21,206. How long would it take to clear the smoke there after blasting?—An hour or two; we have only worked it latterly with four men, and they have managed blast there just before leaving the place. That is a most remarkable instance. In driving, you should not only have very large levels, but should drive at a perfectly dead level, the ventilation depends upon its being perfectly level; if you lose one eighth of an inch in a fathom, your current of air ceases to circulate as you go on, but if you keep perfectly level you may drive for almost any distance, for the current of cold air then goes in at the bottom and the foul air comes out at the back or roof. That is a secret not generally known.

21,207. How large is your level?—Full eight feet high, and six feet wide.

21,208. Are you always careful to take your stuff out soon?—Yes, we always remove it a considerable distance backward; at least as far back as the cross-cut, where there is any danger of obstructing the circulation of air. Taking any impediment out of the way, and driving a dead level, you may drive almost any distance.

21,209. Does not it very much depend upon the strata through which you drive?—I do not lay much stress on that. An old Welsh agent, who first gave me the idea, drove a level 500 fathoms at Llandudno without any artificial ventilation or any communication whatever, by having a large level and driving it perfectly dead. His nominal loss of level was one inch in eight fathoms, but he did not lose so much as that. I have gone through that level scores of times, since it is communicated with the mine.

21,210. When you were driving the 112 from Dyer's to Gwen shaft, did you drive it in the same way?—Yes, we were obliged to drive it at a dead level to meet another level.

21,211. Did you meet well?—Yes, quite well.

21,212. There is no extra expense in driving dead?—None whatever. My opinion is, that we are not yet up to the proper size for driving, not only expeditiously, but economically, because when we have to blast the ground it requires a certain range or liberty for it.

21,221. What was the state of ventilation when you came?—Much the same as at present; being a rich mine, from the frequent working communications, it was tolerable.

21,222. Are not your veins very uncertain, sometimes very small and sometimes very large?—Yes.

21,223. When they are very small, if there is room enough for a man to pass through, do you save the expense of making a larger level?—We make a good level even then,

(C^{w}.) *Ventilation.*

21,224. Did they in olden time?—Yes, tolerably good, but not to be compared with ours; we have greatly improved it.

21,225. Even in olden time they were not content to let the men drag through those places?—No

21,226. But at present you, as a matter of economy, carry your levels high and wide?—Yes.

21,227. And you find that by driving at a level you can go on a very great distance without ventilation?—Yes.

21,228. We have heard a good deal in the last week about smelling bad air, have you worked your way up as a miner?—Yes, I have been 35 years practically engaged in mines, two-thirds of which as a working miner.

21,229. What is your opinion on this point; can you or can you not from experience, if air is bad, even before the candle shows it, smell bad air?—In some instances I can do so, certainly.

21,230. Before the candle shows a dulness?—It depends upon how the foul air arises. If it is from gas generated from decaying wood, it will naturally give a smell, but if it exudes from the rock itself I doubt whether I could smell it.

21,231. (*Mr. Holland.*) Suppose there is insufficient air?—That, of course, would be much the same as an ill-ventilated room, where we can perceive it in a moment.

21,232. By your own sensation do you feel a deficiency of ventilation before the candle shows it?—When it gets very foul and the candle shows it of course it is very trying to the system, and one can perceive it then, but I do not think that I could always detect it before the candle shows it.

21,242 (*Mr. St. Aubyn.*) You have stated that, as a general rule, if you work a level perfectly dead it will ensure good ventilation to the furthest end, within a reasonable distance?—Yes. The level which I spoke of which was driven 500 fathoms is now communicated. It was communicated before I saw it, but they were able to drive it without any artificial ventilation, or any communication.

21,243. Up to what distance should you say that that can be done as a general rule?—I should not hesitate to undertake a cross-cut 250 fathoms. It might depend partly upon the nature of the strata.

21,244. That distance would be modified by the nature of the strata in which you were working?—Most certainly.

21,245. What strata are most favourable for carrying a level through a long distance, and what are not so favourable, comparing, for instance, slate and granite and killas?—My experience in that respect is confined to the instance in the limestone of Llandudno, which I spoke of, and the slate rock of this mine. I have never seen that experiment tried in the granite in Cornwall.

21,246. But still that rule of yours of carrying a level perfectly dead would apply to a certain extent to driving through granite, and killas, and so on?—Quite so, in my opinion.

21,247. From your experience, is it generally the practice to carry the levels as dead in Cornwall as here?—I think not. My experience there was derived from 30, 20, and up to 15 years ago, when I left Cornwall; but I had not seen in Cornwall a level so perfectly dead and so wide for the object of securing good ventilation as I have seen since, when I adopted it. On this point I may be allowed to mention that I published a letter a short time ago in the Mining and Smelting Magazine, a new periodical in mining, and in answer to that letter Captain Charles Thomas, of Dolcoath, gave a letter stating that if I were to come to Cornwall now, I should find the levels very much improved since I left it 15 years ago.

21,248. (*Mr. Kendall.*) But still coinciding with you?—Yes, he quite agreed with my general views.

21,249. (*Chairman.*) Driving perfectly level, for the object of ventilation, the least accumulation of deads would obstruct it?—Most certainly.

21,250. (*Mr. Holland.*) Have you any levels in your mine which are 8 feet high and 6 feet wide, which are not quite at a dead level?—No, I do not know that we have. Our ordinary levels are 7 feet by 5, although they may be a little more or less, but they are generally more. I require that they shall be a bold good level. I tested the accuracy of this principle at Llandudno mine.

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21,251. Is a slight variation in the level very important?—From my experience as a miner, I have proved that if you rise up in the back the air will not circulate up above in a level as it will below, because the fresh air is more dense, and will naturally descend to the bottom; it will not ascend against foul air, and the circulation will not take place as will be the case by the fresh air descending, being more dense. I know from experience that by driving a level perfectly dead you get the chance of the cold pure air coming in at the bottom, and the lighter impure air going out at the top. If the level has no impediment the smoke and foul air will always go out at the roof, and the dense air will come in at the bottom.

21,252. (*Mr. St. Aubyn.*) You have stated that the accumulation of deads would have the same effect as having a bad level?—Quite so.

21,253. How long do you allow the deads to remain here before clearing them out?—The men wheel them back to a certain point immediately.

21,254. (*Chairman.*) How do you enforce the removal of the deads?—We have a rule and we explain the matter to the men and show the necessity of it for their own sakes, and sometimes we are obliged to use rather harder words, but I do not think that we ever go to the extreme of fining them for the non-observance of it.

Mr. Richard Lewis Parry.

21,365. (*Sir P. Grey Egerton.*) In which mine?—Both mines, but they say that the Parys mine is improved lately.

21,366. (*Mr. Holland.*) Judging from your own knowledge, is that a correct opinion?—Yes; I have been down both of them.

21,367. Is it your opinion that they are badly ventilated?—Yes.

21,368. From what do you draw that conclusion?—From the difficulty of breathing which I experienced myself when I was down.

21,369. You observed a distinct closeness of air?—Yes.

21,370. Did you notice that the candles burned badly in any part of the mine?—Yes, in some drifts.

21,371. (*Mr. St Aubyn.*) Which mine are you now speaking of?—Both of them.

21,372. (*Mr. Holland.*) Have you been down both of them frequently?—Not very often.

21,373. Have you noticed a very perceptible closeness of air when the candle did not burn badly?—Yes, decidedly; so much so that in the Mona mine I had to go upon my knees to get through, and when I did got through, I found two men working there, and the candles were very dim.

21,374. Are you satisfied that that disagreeable feeling was the result of closeness of air, and not of unusual fatigue on your own part?—There was no ventilation whatever there excepting through the hole that I crawled through; there is no question about that.

21,377. Do they complain of powder smoke?—Yes.

21,378. Do you think that complaint just?—Yes, very just.

21,379. Have you been able to trace any ill effect from the breathing of powder smoke?—No, not particularly more than from foul air. I take the place altogether.

Capt. George Trewren, Mona Mine.

21,437. (*Chairman.*) Do you use any artificial means of ventilation?—Yes, we have some air pipes and a machine.

21,438. How is the machine worked?—By manual labour.

21,439. Have you any air pipes without a machine?—Yes, at the new shaft.

21,440. Do you find that answer?—Yes, very well indeed, for the number of men that we have.

21,441. How long is the powder smoke getting out?—It does not stand perhaps a quarter of an hour.

Capt Richard Ridge, Rheidol Mine.

21,473. (*Chairman.*) What is the greatest depth at which you are working?—Our deepest level is about 160 fathoms.

21,474. Are you working there?—Yes, draining a level.

21,475. How far is that level from your shaft?—It is about 150 fathoms.

(C^v.) *Ventilation.*

21,476. What are the other levels?—We have one level driven in the hill of a depth of about 160 fathoms, and another at about 140 fathoms; the lowest level is an adit level from the valley.

21,477. Do the men enter by the adit level?—Yes; that is driven in 300 fathoms.

21,478. Where the men are working now at the 150 fathoms, which is the nearest communication to any other level?—25 fathoms from it.

21.479 Do you require any artificial means of ventilation?—We have rises.

21,480. Have you any artificial means besides that?—No; some time back, before we put a rise, we had a waterfall, and I have the same now in driving the level up here, at 160 fathoms we have a waterfall.

21,481 You do not require it at the other level at present?—No

21,482. What distance from a rise or a winze have you ever driven without a waterfall or other artificial ventilation?—About 40 fathoms.

21,483. When you come to that distance you think that it is necessary to put in air?—Yes.

21,484 And not before?—Yes, it would be better if you could put it in, but we generally run it on as far as we can, although it would be all the better to put it in at 20 fathoms.

21,485. Why do you not do so?—Because we try to save the expense to the Company, though in the end it is the worse for the Company, because I could get the ground driven much cheaper if the air was put in at once.

21,486. Are the Company, do you suppose, aware of the fact which you have stated that it would be to their interest to put in air sooner?—Yes, they are a little aware of it; but they will say, "Yes; push on a little further; we will do as well as we can for a bit, and we can see if the ground turns out better, and we shall better afford it.

21,497. Are you acquainted with other mines in this district?—Yes, I have inspected the South Lishurne Mine; it is not under the Messrs. Taylor.

21,498. (*Mr. Kendall.*) What did you go there for?—Inspecting for the Company: I have been there several times on the Company's behalf.

21,499. (*Chairman.*) Are there many men working there?—About 30.

21,500. Is it well ventilated?—It is only middling.

21,501. Do they adopt any artificial means there?—They are just like we are, pushing on; they ought to have air; it is a mine which will not pay its way, and they are trying to keep down the expense, and in the end it is the worse for all.

21,502. In your opinion, is that generally the case in the smaller mines in the district?—It is generally the case throughout the district; if you get a man to tell you the truth you will find it the case everywhere.

21,503. The poverty of a mine prevents the adventurers working it properly?—Yes.

Capt. James Raw, Cwm-Ystwith Mine.

21,575. (*Chairman.*) In any of these levels, what is the longest distance which you are driving from any rise or winze?—I think that at one of them we have not any communication the whole length of it; it is 400 fathoms, but we have a machine blowing in air with a water-wheel.

21,616. What is the greatest length which you go before you communicate?—Not more than 20 fathoms.

21,617. Do you carry good air for 20 fathoms?—Very good; there is no difficulty at all for 20 fathoms, and then we put up a rise.

21,618. Can the men do as good a day's work at 20 fathoms as they can at the commencement of the level?—I would not say that it is quite as good as at the commencement, but it is quite good enough; the candle will burn.

21,619. Can the men do as much work in a day at 20 fathoms?—I think that they can.

Capt. Henry Thomas.

21,665. (*Chairman.*) Do the captains under your charge represent to you when the ventilation of a mine is not good?—Yes. We generally discuss the various bargains which are set, and all these points arise in the discussion of the workings, and we make the arrangements accordingly.

21,666. What kind of machine do you generally recommend to be adopted for ventilation?—We always use and find them effective, fan blasts attached to pipes for forcing the air into the levels; but there is rather a difference of opinion about that, whether the air should be extracted or forced in. Many people like the one more than the other. I rather like exhaustion best myself, but there is no specific plan. We find that the one which we generally use is very effectual, which is that of forcing the air in. We take care to keep the pipes very tight

21,667. What sized pipe do you use?—We generally use 4-inch pipes.

21,668. Of what material?—Galvanized iron or cast-iron pipes when we have a stock of old pipes on the mines, but all the new pipes which we apply are galvanized iron pipes. They are very thin and light.

21,675. (*Mr Kendall.*) In all the Taylor mines that you have anything to do with you have the same system of pa- ?—Precisely.

21,676. And also great attention is paid to the ventilation?—As much as we possibly can.

21,677. I suppose you find that although ventilation is a very costly matter, yet in the end it is a more economical mode of proceeding?—Yes, unquestionably. The power of the miners is so much improved by it. You cannot get half the work from a man working in an ill-ventilated place.

21,703. (*Sir P. Grey Egerton.*) Do you often visit the mines yourself?—Yes, very often.

21,704 Do you go underground?—Yes, occasionally.

21,705. Supposing that you are driving a new level, do you trust to the captain of the mine to inform you if the air is getting bad in that level, or do you satisfy yourself upon that point?—It becomes a matter of general discussion; we always take the plans before us, and we consult as a body on those matters; we generally do it by a full examination of the plans and the distance of one winze from another, and they generally mention it in the first place, but when I go underground, if I saw that the air was bad I should make a point of mentioning it myself, and we should talk the question over. Sometimes the necessity occurs to them, and more generally to them, and sometimes to myself, but I believe it is never omitted to be mentioned.

21,706. Supposing you are yourself satisfied that the air in a certain working is bad, have you the power of remedying it without applying to your superiors?—Yes, certainly.

21,707. Are there cases where you do give an order for applying artificial ventilation where you think it necessary?—It would be so if there was any question between me and the captains.

21,708. I am supposing that the air is bad?—I should not generally interfere in that proceeding individually; it would become a matter of discussion and of general agreement with the captains themselves; we generally work in that way.

21,709. But as general superintendent, is it in your power to order an apparatus to be put up?—Yes, I could do it.

21,710. (*Mr. Kendall.*) Without consulting the adventurers?—Yes. I speak of such machinery as we are in the habit of applying in this country; I do not mean to say steam engines, and large water wheels, and those heavy things, but I mean a small apparatus, air pipes, and so on.

21,711. Is it the general system of Messrs. Taylor to have working plans kept up at all their mines?—Yes.

21,712. So that you can consult them at any time?—Yes; you can refer to them at any time you like.

Capt. THOMAS BALL, Lisburne Mines.

21,732. (*Chairman.*) At what ground are the largest number of men working at Level Vowr?—The principal part of the men are working away in the sides above the 60 fathoms level.

21,733. What is the deepest part?—130 fathoms.

21,734. Take the 103 fathoms level, namely Glog Fach, have you any artificial means of ventilation?—Not at that level.

21,735. At what level have you to use artificial means of ventilation?—We had a fan machine at the 73, and for the last two or three days before your Lordship came there, we threw it away, and put in a trap-door for ventilation, but it failed; we had to apply the machine again.

21,736. Have you done anything with respect to the shaft where the men complained of the air when sinking the shaft?—Yes, there is plenty of air there.

21,737. How have you remedied that?—We have fixed a blast machine, and when there is any wind there is plenty of air, and when there is no wind they put the fan machine to work.

21,738. What distance is Level Vowr driven?—700 fathoms from the mouth, but 240 from the point of ventilation.

21,739. How do you ventilate the end of that?—With a fan blast.

21,740. How is it worked?—With a 12 feet water-wheel.

21,741. Whereabouts is it placed?—About 30 fathoms east of Addy's shaft; the current comes in, it is at the side of the level.

21,742. And you find that that gives plenty of ventilation?—Yes, it gives plenty of ventilation for the men to work, and we generally find that it clears the smoke.

Capt. ROBERT NORTHEY, Bwlch Consols, &c.

21,774 (*Chairman.*) Have you any means of ventilation there for the men?—I have a duck machine 12 feet long which will give air enough for any 500 men in the world; the men can work there as well as they can out in the street.

21,775. What is the longest level which you are driving in Gelley Riern?—About 200 fathoms

21,776. How far is it driven from any winze or rise?—There are only two men working in it. It is driven, I should think, from 70 to 80 fathoms from any winze or rise.

21,777. They only work eight hours in the 24?—They only work just as they please; they never stop there after the blast; they do not complain a bit of the air.

21,778. They only work a few hours there?—Just so.

21,779. There are no artificial means used there?—No.

21,780. Do you think that the men suffer at all from working in bad air?—I do not think they do in this county; in Cornwall they do; I have suffered from it, and suffer from it to this pay.

21,781. Are you affected in your breathing?—No, but I am dreadfully rheumatic in consequence.

21,782. Where did you work?—In the Great Consols about seven years, and I worked in East Wheal Rose, and I worked in Wheal Penrose.

21,783. How long is it since you worked in Cornwall?—I have been to America since then; I should say that it was 22 years ago, but I have been an agent in Cornwall since then.

Capt. NICHOLAS BRAY, Llwynmalees Mine.

21,821. (*Chairman.*) How far were you driving from any winze or shaft?—We have two shafts down to the bottom level; the 46 fathoms level; they are about 40 to 45 fathoms apart, but our furthest winze for ventilation is about 30 fathoms.

21,822. Are you obliged to employ any artificial means, or can you do without it?—We can do without it; we have ample air, because we have a current of air passing from one shaft to the other; at the forebreast the air is as pure as it is here.

21,829. (*Mr. Holland*) Do you work chiefly levels from one shaft to the other?—Yes; we have ventilation from one shaft to the other.

21,830. Have you any close air from one to the other?—No; I had a machine to push in air from the 36 to the 46.

21,831. Do that machine enable you to keep pure air the whole time?—Yes, it will drive the smoke back.

21,382. Is one shaft up-cast and the other down-cast?—No, it depends upon the wind, sometimes you see the smoke going up the lowermost one, and at other times up the highermost one; one is a little higher than the other.

21,841. (*Mr Kendall*) Is more attention paid to ventilation now than there used to be when you began?—I think there is on the average. Miners now, I think, will not work in places where they worked formerly.

21,842. They are sharper?—They are not only sharper but they have more means now. Persons can emigrate to some other place.

21,843. They are better off?—Yes.

21,844. They are more independent?—They are more independent than they were in my younger days, I think. When I was a lad if you did not work there you might go, and you would find some difficulty in getting a situation elesewhere.

21,845. Ventilation is forced on the adventurers more more than it used to be?—I think the mines are better ventilated on the average.

21,852. (*Mr. Holland.*) Are men more awake to the necessity of ventilation now than they were when you were a youth?—That I really cannot say. If the air is a little impure, men complain, and then of course we rectify it as soon as possible; and not only that, but there cannot be a better mine than ours is at the present moment, because we have two shafts down drawing from one shaft to the other.

Mr. Rowland Rowland.

21,912. (*Sir P. Grey Egerton.*) Of what description is the heart disease—is it hypertrophy of the heart or valvular ossification?—We have a good deal of rheumatism, and therefore have velvular disease in miners in consequence of it. They are exposed to cold, and then their hearts get affected, but I know that we have the diagnosis also of hypertrophy in the miners' consumption, but I do not think that we have many cases of it. I think that ventilation in the mine is the great thing which we want. If we have sufficient ventilation, I think that that is the thing which we particularly require.

21,913. (*Mr. Holland.*) How would you guard against the dust?—It would blow the dust away.

Mr. William Henry Paull, Goginau Mine.

22,083. (*Chairman.*) What is the produce of the Goginau mine?—Silver lead.

22,084. How many men have you working underground?—About 50.

22,085. Are you driving or sinking?—We are driving the 100 fathom level, and we are sinking from the 60 to the 80, to get a communication, and we are putting up a rise against this part (*pointing to the plan*).

22,086. How far is the breast of the 100 fathoms level which you are now driving from the nearest shaft or winze?—About 160 fathoms.

22,087. Have you any artificial means of ventilation?—Yes.

22,088. What?—What we term a duck machine, worked by a wheel.

22,089. How is the air taken?—In iron pipes.

22,090. How many men are working?—Six men.

22,091. Do they work eight hours shifts?—Yes. We are rising from the 80 fathoms level, and we are sinking from below the 70 fathoms level.

22,092. Have you any artificial means of ventilation there?—No, not at present.

22,093. How long shall you be before you get a communication?—We are just upon the point of holing.

22,094. (*Mr. Kendall*) How is the air there now?—It is very good in the winze but not very good in the rise.

22,095. (*Sir P. Grey Egerton.*) How do the men get there?—They come down an inclined plane; then walk into the 60 fathoms level, and then go down this shaft.

22,096. (*Chairman.*) How long is the powder smoke getting away from that end (*pointing to the plan*)?—Not long.

22,097. About how long?—A quarter of an hour.

22,127. (*Mr. Kendall.*) Then you are 160 fathoms from a shaft or winze at the 100 fathoms level, and you use a duck machine to throw in air?—Yes.

22,128. What pipe have you?—A 6-inch iron pipe.

22,129. How many men are there working in that end?—Six.

22,130. Eight hours each?—Yes.

22,131. Do they complain of the air at all?—They do complain sometimes.

22,132. Is not the duck machine powerful enough to throw in air?—Yes, there is good air there.

22,133. Then why do they complain?—I do not know; they do complain a little sometimes.

22,134. Have you been in there yourself frequently?—Yes.

22,135. Is the air dead there?—No.

22,136. How far is the pipe in from the end; how close up is it?—Within about a couple of fathoms.

28,137. There is no leakage to the pipe at all?—No.

22,138. What size is your duck machine?—Five feet wide and eight feet long.

22,139. You have gone 160 fathoms in, and the men complain at times; how much further in do you intend to go before you communicate with the 80 fathoms level?—I cannot say that.

(C$^{\rm w}$.) *Ventilation.*

Mr. James Garland, East Darren Mine.

22,173. (*Mr. Kendall.*) How far off a winze are you?—From 30 to 35 fathoms. We are only 2 fathoms from a winze at the 92 fathoms east, and the winze is only 2 fathoms deep.

22,174. (*Chairman.*) What is the next place?—A level driving east, somewhere about 7 fathoms east of the winze.

22,175. What is the furthest point where you are driving from any winze?—At the 68 fathoms going west; there are two men working there; they are driving a cross-cut.

22,176. Is there not a good deal of moisture in your mine?—Yes, in places.

22,177. Do you consider that the small streams and drippings of water assist ventilation?—Yes, greatly.

Capt. John Williams, Cwm-Erfin Mine.

22,193. (*Mr. Kendall.*) On the 20-fathoms level, where you are sinking a winze, you are 22 or 23 fathoms from a rise?—Yes; but in eight weeks this will be communicated. [The rise and winze have since been communicated.]

22,194. Is that the worst part of your mine?—That is the only place where any smoke lies.

22,195. Every other part of the mine is well ventilated except that part?—Yes; the smoke lies here about a quarter of an hour or 20 minutes, and no more. That is in the 20-fathoms level and the 32-fathoms, sinking from the 20-fathoms and rising from the 32.

22,196. You think that a communication in eight weeks will remedy all that?—Yes, I am quite positive of it.

22,197. How many men work in the 32 fathoms rise?—Four.

22,198. And how many men in the winze at the bottom of the 20 fathoms?—Four.

22,199. (*Chairman.*) That leaves eight hours rest at night?—Yes; there is no one working in either of those places at night.

22,200. Why is that?—If they worked by night in all probability it might cause smoke; it would not be so clear in the morning.

22,201. (*Mr. Kendall.*) It is in order to collect a little good air?—Yes. That is the only place where we have any smoke.

22,202. You are working in slate?—We are working on the course of the lode.

22,203. The country is slate?—Yes, quite a clay slate.

Capt. Thomas Henwood, Snailbeach Mine.

22,358. (*Mr. Holland.*) Have you any ends here where the candles will not burn freely?—No.

22,359. Have you any ends where the powder smoke hangs for an hour?—No.

22,360. What is the longest time that it hangs?—From twenty minutes to half an hour.

22,361. Are there many ends in the Fowey Consols, where the powder smoke hangs for an hour or more?—Yes, more than two hours; it is seldom clear from one end of the week to the other.

Capt. Richard H. Vivian, Roman Gravels Mine.

22,505. (*Chairman.*) How many shafts have you?—We have two shafts.

22,506. To the surface?—Yes, from our day level, but not all the way continued; but we have winzes sunk between the different levels; we have two levels, but we call one the day level and the other the adit. The level does not take away the water; the adit takes away all the water.

22,507. What is the depth of your adit level?—20 fathoms.

22,508. Have you more than one fan machine at work?—Only one, and that we want to keep only as short as possible; we are doing that just in a case of emergency to hole places to ventilate properly.

22,509. And the proper ventilation would be by communicating?—By a communication between the level and the winze.

(C$^{\text{v}}$.) *Ventilation.*

22,510. Is either of the shafts an upcast and the other a downcast?—Yes; it is not always the same; sometimes the draught goes down one shaft and up the other, as the wind changes it changes; the draught sometimes goes in at the day level and sometimes it comes out; it just depends upon the way that the wind is.

22,511. How long is the smoke hanging in any breast or level where you are working?—In the worst place that we have got I should think that it might be somewhere about a quarter of an hour before it is thoroughly cleared out; that is only the very worst place that we have.

22,512. How many men are working?—Four men in a fore-breast with the exception of one.

22,527. Where are the men sinking?—In the first north vein, from the 20 to the 40, to make a communication right over the fore-breast there.

22,528. Are the other men rising?—No, that would be rather difficult. The air is very good, because the candles burn easily; but the smoke takes some time coming out. We are sinking to come down before it gets worse. Nine men are sinking there, and that will then be as good for air as it is here.

22,529. Where the fan is, it is not good air?—Where the fan is is in the six fathoms level.

Mr. John Vivian, Roman Gravels Mine.

22,563. (*Mr. Holland.*) The levels there are very much longer than they are here?—Yes, some of them go a mile and a half in, and there are very few shafts.

22,564. Those very long levels are ventilated artificially, are they not?—Yes, with blasts chiefly.

22,565. Is that an effective mode of ventilation?—No, but it is obliged to be done sometimes; for the sake of economy they put blasts into certain places at times.

(C a$^{\text{v}}$.) *Poor Air.*

(*a*$^{\text{v}}$.) POOR AIR.

Capt. John Darlington, Minera Mine.

19,917. (*Mr. St. Aubyn.*) Can you tell us, in a few word, to what you ascribe that difference?—I imagine that there is an immense quantity of a foul kind of air which is always hanging about the killas in Cornwall, a sort of carbonic acid gas which is always hanging about it, and the miner inhales that, and consequently it brings on what they call a decline in Cornwall, but you never find that here. I most positively declare before you that I think that the average of life of every miner in this country is above 55 years of age.

19,918. Then you ascribe the difference to natural causes?—Yes.

19,919. And not to any difference in the mode of working the mines?—I do not know a man who has died from any thing like bad air that he received in the mine.

19,920. Are the mines, generally speaking, as deep here as in the Cornish mines?—No, there are none in this country like the Cornish mines.

Capt. Sampson Michell, Park Mine, &c.

20,023. (*Chairman.*) Have you on any occasion found the air bad, so that you are obliged to use artificial means?—Yes.

20,024. How do you judge when the air is bad?—We generally find it by the deadness of the candles burning, and its affecting any person who is in it.

20,025. Is that the only means by which you judge of it?—Yes, and the powder smoke lying so that the men cannot get on with their work so well.

20,044. Do the men always complain to you if the air is bad?—They do mostly if it is so.

20,045. But will they work on sometimes without doing so?—Yes, they will work their contract through.

20,046. Even although they find the air a little poor?—Yes.

20,047. (*Mr. Leveson Gower.*) Have you ever known the air bad and the candles not affected in the burning?—No, I do not remember that I have.

20,048. The minute the air is bad the candles burn differently?—Yes, and they are obliged to put them on one side.

(C a$^{\text{v}}$.) *Poor Air.*

Mr. Peter Parry.

20,506. (*Chairman.*) Have you a record of six cases at Bryngwyn Mine on which you held an inquest?—There were seven cases, and the following are the particulars of them:—James Clarke, aged 24 years, miner, Mold, died September 4th, 1854, inquest, September 6th, 1854; verdict, casually killed by foul air in a lead ore mine shaft. John Jones, aged 16 years, miner, Mold, died September 4th, 1854; inquest, September 6th, 1854; verdict, casually killed by foul air in a lead ore mine shaft. George Oldfield, aged 42 years, miner, Mold, died September 4th, 1854; inquest, September 6th, 1854; verdict, casually killed by foul air in a lead ore mine shaft. Thomas Oldfield, aged 14 years, miner, Mold, died September 4th, 1854; inquest, September 6th 1854; verdict, casually killed by foul air in a lead ore mine shaft. Charles Matthews, aged 44 years, miner, Mold, died September 4th, 1854; inquest, September 6th, 1854; verdict, casually killed by foul air in a lead ore mine shaft. William Oldfield, aged 22 years, miner, Mold, died September 4th, 1854; inquest, September 6th, 1854; verdict, casually suffocated and smothered in a lead ore mine shaft from the effect of impure air. Thomas Morgan, aged 29 years, miner, Mold, died September 4th 1854; inquest, September 6th, 1854; verdict, casually suffocated and smothered in a lead ore mine shaft from the effect of impure air.

Capt. Richard Ridge, Rheidol Mine.

21,527. (*Mr Holland.*) You have told me that the smell of a close level and the feeling of oppression is very great?—Yes.

21,528. In that case, does the candle show a bad burning as soon as you feel an oppression?—No, not in lead mines.

31,529 You feel bad air before the candle shows to burn badly?—Yes.

21,530. Is that a general rule?—Yes; whenever there is mineral you will get a taste of it sooner than where there is no mineral.

Capt. Robert Northey, Bwlch Consols.

21,799. (*Mr. Kendall.*) From your experience is the different in a lead mine from what it is in a copper mine?—I am certain that the atmosphere is much more cold in a lead mine.

21,800-1. But how is it as far as the air goes?—I do not know that there is a great deal of difference, I should rather take a lead mine if I was going to work in a mine, because it is cooler.

21,802 At the same depth?—At the same depth.

21,803. With regard to air, from your experience can you speak as to the smelling of bad air?—Yes.

21,804. Can you detect it?—Yes.

21,805. I do not mean the air from the powder smoke?—No, I can detect bad air, I could not detect air a little impregnated.

21,806. Can you detect bad air before the candle begins to detect it by burning dimly?—Yes, you can tell it by the exertion of your body, if you are working in it.

21,807. Your body feels languid?—Yes; I can hardly describe the feeling.

21,808. And then you at once know that there is bad air?—Yes, I can tell it in a minute.

21,809. With the candle burning well?—Not well, you could not move the candle with the dexterity that you could in good air, without its going out, but still it would burn.

21,810. Could you at all detect the bad air before you could see any difference in the candle?—We should say that the air was close; we should not call it bad.

21,811. The air is close even before the candle begins to show any signs of it?—Yes.

21,812. (*Mr. Holland.*) Do you feel a diminution of strength from the air being bad before the candle shows it?—Not in youth; I should now, I suppose.

Mr. Rowland Rowland.

21,872. (*Chairman.*) Have you ever been underground yourself?—Yes.

21,873. Have you ever yourself perceived where the air has been bad?—Yes, very much.

21,874. From the sensation which you experienced there, should you say that it was likely to affect the

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men there?—Yes, certainly. If the air was rather confined, without plenty of circulation, it would be very unpleasant indeed to go to an end for an hour or two.

21,875. Do you think that the impurity of the air arises from any deficiency of oxygen, or from the powder smoke and other impurities in the mine?—I think that the sulphurous acid would be the principal thing. I do not think that they are so confined as you are when breathing in a public room. I think that the mischief does not arise so much from the oxygen being consumed as from the deleterious effects of the powder smoke and the dust.

21,882. (*Mr. Holland.*) Have some of the mines the reputation of being more unhealthy than others?—I think that Cwm Ystwith on the whole, may be, if anything, rather more unhealthy.

21,883. How does it differ from the others; what makes it more unhealthy?—I think it is rather deeper; I do not know why it should be so.

21,884. Is it more dusty than the others, or the same?—About the same, I think. Cwm Ystwith is a little narrow valley, and people do not go out of it; and they marry one another from generation to generation; nearly all of them are Howells or Burrells, and they are rather weak people.

Mr. William Henry Paull, Goginau Mine.

22,108. (*Mr. Kendall.*) Have you any men who are working from the 80 fathoms level up to the 70?—No.

22,109. Have you been underground much yourself?—Yes.

22,110. Lately?—Yes, almost every day.

22,111. You are now sinking a winze from the 70 fathoms level, and rising from the 80 fathoms level, in order to make a communication?—Yes.

22,112. Is that the worst air in the mine at the present moment?—Yes, I think it is.

22,113. How many men work in the rise?—Two.

22,114. In the 24 hours?—Yes.

22,115. It is very desirable that you should have a communication?—Yes.

22,116. If that be the case why do you only work two men?—On account of the air being too bad for them to work more.

22,117. How many hours do those men work?—Eight hours.

22,118. Have you seen them when they have come up?—Yes.

22,119. Have you seen them whilst they have been there?—Yes.

22,120. Are they exhausted much while they are there?—No.

22,121. Do they complain?—No.

22,122. How does the candle burn there?—Pretty well.

22,123. Does it burn uprightly, or are you obliged to put it on an inclination?—It burns upright.

22,124. (*Sir P. Grey Egerton.*) How many men are working in the winze?—Six.

22,125. (*Mr. Kendall.*) Will it be holed in a few days?—Yes, we expect so. This point was holed in a few days, where there is now good ventilation,

22,126. That end is the worst end; have you any other end?—We have only this end and the 100 fathoms level driving.

Mr. James Garland, East Darran Mine.

22,165. (*Chairman.*) Where is the next place?—The next is driving 104 fathoms west.

22,166. Have you any artificial means of ventilation there?—Nothing but the winze.

22,167. How far is it from the winze?—40 fathoms.

22,168. Do you think that the air is close there?—Not very close: four men are working there; we give one third of the time.

22,169. When the air is close you generally diminish the number of men working; you leave a longer time?—We leave a longer time between.

(b^{w}.)—TEMPERATURE.

Mr. Edward Davies.

(C b^{w}.) *Temperature.*

20,140. (*Mr. Holland.*) Are not miners exposed to more frequent alternations of temperature than ordinary labourers whom you visit, the work being hotter?—I do not know much about the interior of the mines, and therefore I can hardly speak about that.

20,141. Have you ever noticed miners when they come up from the mines?—Not particularly.

20,142. Do you know that it is common for miners to be in a state of profuse perspiration when they come up from the mines?—I have never noticed it, but very likely it is so.

20,143. Are the miners in this part of the country in bleak situations frequently?—There are some of them sheltered between hills, or little rocks or mountains in the valley part, but most of them are in exposed situations.

20,144. Have not the miners frequently to go considerable distances home from the mines?—Most of them in Minera; many live in the immediate neighbourhood; some live four or five miles off, but there are very few who do not live in the immediate neighbourhood.

20,145. If miners get hot at their work and have to go in bleak situations to their homes, it must predispose them to pulmonary diseases?—Yes, in some measure.

20,146. But you do not think that those diseases are more frequent with them than among the rest of the population?—My attention has not been particularly called to the fact of their being more chest disease among miners.

20,147. Are not they much more exposed than the rest of the population to breathing dusty air?—Yes, I should say so, from the nature of their occupation.

20,148. Is not that likely to produce pulmonary disease?—Yes.

20,149. Miners are exposed to a great deal of hard work in climbing?—Yes.

20,150. They are apt to be heated by that exertion?—Yes.

20,151. And they have then to go home long distances in very exposed situations?—Yes, of course it would to a certain extent predispose them to those diseases, but this is only supposition; their occupation is laborious, and the exertion of getting up to a certain height must make them warm, but I am not aware that they are so.

20,152. If the population generally are peculiarly liable to pulmonary complaint from the alternations of temperature, and if the miners are more exposed to those alternations of temperature than the rest of the population are not the miners more liable to pulmonary disease?—Yes, it would seem so.

(C d^{w}.) *Dust.*

(d^{w}.)—DUST.

Mr. James Williams.

20,812. (*Mr. Holland.*) Do the miners complain much of dust as an irritating cause?—Yes, they complain a good deal of dust.

20,813. Is there much difference as regards the irritation from dust in different kinds of mines?—Yes, according as the mine is wet or dry.

20,816. Do they complain of their great liability to catch cold?—No, they do not complain so much about that. They expose themselves very unnecessarily, I think, sometimes. They say that they prefer working in a wet place to a dry one; that is my experience of them.

20,817. Is that because they have less dust?—Because they have less dust and smoke. They consider it much more wholesome.

20,818. Then it would seem as if the dust was more injurious to them than the damp?—I put that question to many of them, and they do not consider that the dust brings on their disease, but that it irritates them very much, and is a great nuisance to them. I have asked several very intelligent and experienced men about it, and they all say that the thing which injures them is the bad air,—being obliged to work in places where their candle will hardly burn.

Capt. William Bowen, Talargoch Mine.

20,962. (*Mr. Holland.*) Is your mine pretty free from dust?—Yes, where it is a little damp, but where it is dry there is sure to be dust.

20,963. Is the dust chiefly in the limestone rock?—Not so much; by boring there is a little dust, but we put water in to cure the dust.

20,964. Then the men are not much annoyed by dust?—No, very little.

(C^{w}.)—VENTILATION.

(Cd^{w}.) *Dust.*

20,965 Do the men work much in chert here, is there much chert ?—A little at the east end.

20,966. Are they annoyed by dust there ?—About the same as in the limestone, because they use water there too, and as you get a little deeper in the ground, there is a little dampness, so that the dust cannot fly about.

20,967. Is the water quite effectual in keeping down the dust of the chert ?—Yes, if you get water in the hole you will have no dust, unless it is a hole in the roof, and there you cannot get any water in, you must chance that.

Mr. Richard Lewis Parry.

21,375. (*Mr. Holland.*) Are the mines in any part disagreeably dusty ?—No ; there is too much damp in them to be dusty.

21,376. Do the men complain of annoyance or injury from dust in the working ?—No.

Mr. Rowland Rowland.

21,876. (*Chairman.*) Do you think that there is much dust in these mines ?—Yes, a considerable deal.

21,877. And you think that likely to affect the men ? —I think it is very likely to affect 'the lungs, and to bring on bronchial affections.

Mr. J. Hughes.

22,260. (*Mr Holland.*) Is that mine so called because it is working in a gritty stone ?—I do not know.

22,261. Is it a peculiarly gritty mine ?—Yes, it is a loose soil.

22,262. Do the men complain much of the dust of it ? —I never heard them complain. I have only been appointed to that mine two months, and I do not think that I have had more than two cases of illness.

22,263, Do you see anything of the miners who are not ill ; is it a part of your duty to do so ?—No.

Samuel Jones, Snailbeach Mine.

22,461. (*Mr. Holland.*) Is the mine dusty ?—No, not very dusty.

22,462. Is it damp ?—Yes.

22,463. There is sufficient damp to keep down the dust ?—Yes.

22,464. Is there any amount of dust which annoys you ?—No.

(Cf^{w}.) *Smoke from Powder.*

(f^{w}.)—SMOKE FROM POWDER.

Capt. Edward Williams, Park Mines, &c.

19,999. (*Mr Holland.*) Is the powder smoke very annoying ?—Very annoying.

20,000. Does it appear to injure the men ?—Yes, I fancy that it would.

20,001. Is it very important to get rid of it ?—It would be, I think, a most important thing to get rid of it. In the case of men going into the powder smoke in the end the spit would be quite black for nearly the whole day afterwards ; and the water which is thrown down upon the bottom of the shaft is very much discoloured, and it smells very bad.

20,002. That is the water which you use to wash the air ?—Yes ; the water which is thrown down after the blasts have been made. We have a little stream which is dammed up in the cross-cut, it rises about a foot and a half in the floor of the level, while the men are sinking in the bottom. When they put their blasts out, the tap is taken out and the water goes down. When the water comes up it is black.

20,003. How long is it before the smoke is cleared away by that water ?—It is a very short time ; perhaps about ten minutes.

20,004. (*Mr. Kendall.*) From your experience can you state what the difference would be between the time in which the smoke would be cleared without water and with water ?—It would be there for hours without water ; in fact it would not clear away for the whole day after putting one blast there.

Mr. James Williams.

20,814. (*Mr. Holland.*) Do they complain much of powder smoke ?—Yes, they complain a good deal of powder smoke.

(Cf^{w}) *Smoke from Powder.*

Samuel Jones, Snailbeach Mine.

22,465. (*Mr. Holland.*) Are you ever seriously annoyed by powder smoke ?—When we fire first it is in for a little bit, perhaps 10 minutes or so, but we go out and the smoke goes off afterwards.

22,466 Do the miners always keep out of the smoke until it has cleared away, or do they rush back to see what they have done ?—Sometimes they go in, but not to stay ; they go back again out of it to wait till it is over.

22,467. Do not they always as soon as the shot is fired run in to see what is done ?—No.

(*Capt. Evans.*) That is a great failing among the men on this mine ; when they fire the holes they are anxious to see whether they have exploded well, and they go right into it.

(*Jones.*) After we have fired we stop till it has settled a bit and then go in.

(*Capt. Evans.*) If they go in it is only just to see for a minute and then they come out.

(*Jones.*) We know very well that it will do us an injury if we go in as soon as ever it is fired.

(Ck^{w}) *Wat Blast.*

(k^{w}.)—WATER BLAST.

Capt. Richard Ridge, Rheidol Mine.

21,487. (*Chairman.*) What is the name of the other mine with which you are connected ?—East Haford mine.

21,488. How many men have you employed there ?— I have six employed there in driving a level.

21,489. Is it a level from the day ?—Yes.

21,490. How far have you gone in there ?—160 fathoms.

21,491. What means of ventilation have you there ?— There they were quite agreeable to my ventilating it in the commencement with a waterfall, because we calculated driving that level 300 fathoms. We have one of the best blasts of air that was ever given in Cardiganshire. We get zinc pipes of six inches in diameter, and you cannot keep a candle within 10 fathoms.

21,492. How is the water applied ?—Running water off the engine, a regular stream running and falling down about 50 feet through a pipe of about a foot diameter, and then it goes in through a tube, it runs out in the bottom. It is made like a clock case and there is a place where the water falls on a solid bottom of water ; but above that a pipe goes out, and the air is obliged to go out through that pipe and cannot get through the solid water.

21,493 You find that the powder smoke does not hang there ?—It is cleared out : the engineers belonging to the railway have been in to see it several times ; I put in the same in Scotland ; I have done a good deal of work in Scotland ; I put three tunnels through the city of Edinburgh ; I was employed under the sheriff of Edinburgh, I was inspector for the safety of the public.

21,494-5. (*Mr. Holland.*) Did you ventilate those tunnels in the same way ?—Yes, in the very same way. I was employed under the head engineer, and he was employed under the sheriff.

21,523. Is the cost of the blowing machine which you have described considerable ?—No ; it is not a very considerable cost ; it is a fall of water.

21,524. Would it not very soon pay itself, by saving 1*l.* a fathom in the driving ?—Yes.

21,525. Are there many cases where you could not get water to work it ?—Yes ; there are many cases where you cannot get water enough, and there it must be done by a machine ; we have machines to blow when we cannot get water sufficient.

21,526. Would it not always pay to use a machine to drive air in rather than pay 1*l.* extra a fathom for driving ?—I daresay that it would be as well, generally speaking.

Capt. James Raw, Cwm-Ystwith.

21,576. (*Chairman.*) You are supplying air to the extreme point of that level now ?—Yes.

21,577. What pipes do you use for the purpose ?—The air pipes made of zinc.

21,578. What is the size of the pipes ?—Four inches.

21,579. Whereabouts is the water power ?—At the end of the level.

21,580. So that the air is driven from the end of the level ?—Yes.

)Water

(C^w.)—VENTILATION.

21,581. Is it a water fall?—No, it is turned by a water wheel and a fan; we can drive it a mile, with this air; it is splendid.

21,582. (*Mr. Kendall.*) It is driven from the tail of the edit?—Yes.

21,583. What is the diameter of the wheel?—Six feet.

21,584. (*Chairman.*) Is the blast sufficient to get rid of the powder smoke at the end?—It will clear it out of the end in two minutes after a blast.

21,585. Is there anything particular in the fan?—No; it is going, I suppose, 500 revolutions in a minute; it is with cog wheels.

Accidents

(E^w.)—ACCIDENTS.

Capt. Edward Williams, Park Mines, &c.

19,955. (*Chairman.*) The men do not pay anything as club money for accidents?—No, we have only had three or four accidents within 16 years. One was a severe one; a man lost his arm; there has been no fatal accident.

19,956. Was the severe accident by blasting, or how?—It was by the engine; he got into the cog wheel; it was from his own carelessness; he wore a long canvas coat, and it caught in the cog wheel.

Mr. Richard Lewis Perry.

21,413. (*Mr. Kendall.*) Do you know any accident which has occurred entirely from the decayed timber work, from a neglect to supply any defects on the part of the timber men here?—I do not know it of my own knowledge, but I have heard it from those who have been complaining, and I have attended accidents from that cause.

21,414. Where they have said that the timber has been giving way, and that the fall has been in consequence of the rottenness of the timber?—Yes.

21,415. Was that in the Perys mine or the other mine?—In the other mine.

21,416. How long ago?—I think it is only six or eight months ago, but they were told not to use that, they were warned not to do so.

21,417. Not to go up that way?—Not to go up that way.

21,418. I suppose it was a shorter way?—I suppose it was more convenient for the men.

21,419. But they were warned not to go that way?—Yes.

21,420. And they did so?—They did so.

Capt. Thomas Henwood, Snailbeach Mine.

22,425. (*Sir P. Grey Egerton.*) Were the fatal accidents of the last eight years from blasting?—No, one was from a fall of a stone out of a shaft, and the other fell into a sump.

) Aban-
Shafts.

(a^w.)—ABANDONED SHAFTS.

Mr. George Hughes.

20,394. (*Chairman.*) What precaution do you take in any of these small workings, when they are abandoned to prevent any accident?—We bind them to close them up and secure them, and we fill up many of them every year; but still you will find a great many of them merely covered over; we covered the whole of them over a short time ago, but the boys about there take delight in knocking them down, and it is fine fun for them.

.) Blast-

(b^w.) BLASTING.

Capt. John Darlington, Minera Mine.

19,881. (*Chairman.*) Have you any accidents from blasting?—We have had two.

19,882. (*Mr. Kendall.*) In what time?—One of them was five years ago last month, and the other was somewhere about six months since.

19,883. (*Chairman.*) Were they fatal accidents?—One of them was fatal, but I think I can easily account for how that man was killed. I always caution the men very carefully indeed, and urge them to put in something, a small quantity of moss or grass upon the powder, so as to keep it down, but this man took some paper out of his pocket, as I understood, and in that paper, I think, there was the end of one of the lucifer matches, and as soon as he commenced the operation, it exploded; it killed the man; he did not die immediately.

19,884. (*Mr. Kendall.*) That is merely your own idea?—Yes.

19,885. (*Chairman.*) What material do they tamp with?—Shale. I fine a man very severely indeed, if I know him to tamp with anything of a silicious substance; anything like spar, or anything of
which has fire in it.
19,886. Have they always shale at
19,887. Is there much shale in th
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20,493. (*Mr. I*
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21,102. (*Sir I*
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21,390. (*Mr.*
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the body.
21,393. Hav
blasting?—Yes.

21,394. Have you had many cases of that sort?—Yes, a good many; some few of the men are alive now, blind of course.

21,395. Is it so much as to be remarked as common; is injury to the eyes a common accident here?—Not very common.

21,396. Have you many blind people under your care?—Not under my care now, but they have been under my care.

(E^{w}.)—ACCIDENTS.

(E b^{w}.) *Blasting.*

Capt. Richard Ridge, Rheidol Mine.

21,515. (*Chairman.*) Have you any accidents from blasting?—No; I have been in this mine now about 12 years, and never had any accident happen, not so much as a broken finger, which is a thing I suppose hardly ever known in this neighbourhood.

Capt. James Raw, Cwm-Ystwith Mine.

21,590. (*Chairman.*) Have you any accidents from blasting?—We have never had one; I have been connected with mines now for 41 years, and we have only had five men killed in all that time in the mine; not one of them was killed by blasting, a storm came and killed two of them in the shaft, the pitman was one of them; that is six years ago, and we have not had an accident since.

Capt. Thomas Henwood, Snailbeach Mine.

22,416. (*Chairman.*) Do you use the fuze or the straw?—The straw.

22,417. Do you use a copper or an iron pricker?—Iron.

22,418. What do you think accidents in blasting arise from?—Through neglect, generally

22,419. In what way?—In changing the ramming, tamping the hole, drawing the pricker, &c.

22,420. Not using proper tamping?—Not using proper tamping.

22,421. What tamping do your men use?—Principally lead ore and carbonate of lime of the best quality.

22,422. Have they always that at hand when they are boring in the country?—They would procure it if it was not at hand. Occasionally we use brick dust.

(E c^{w}.) *Falling away from the Ladders.*

(c^{w}.) FALLING AWAY FROM THE LADDERS.

Mr. Thomas Roberts, Rhosesmawr Mine.

20,620. (*Mr. Kendall.*) Have you had any since you have been in the mine?—Only one.

20,621. How did it occur?—It was the boy's own fault.

20,622. What was the accident?—It was at the dinner hour.

20,623. What did he do?—He went down the footway shaft, and when they were coming up there were three or four of them; and when he was below, about two yards from the top, down he went.

20,624. (*Mr. Leveson Gower.*) Was he killed?—Yes.

20,625. (*Mr. Kendall.*) How do you go up and down; by ladders?—By ladders.

Mr. Richard Lewis Parry.

21,384. (*Mr. Holland.*) Have you had accidents?—Yes

21,385. From falling from the ladders?—From falling.

21,386. Have you had many such accidents?—I do not know that I can say a great number, but still I have had some few.

21,387. Hurts or fatal accidents?—Not fatal.

21,388. Breaking limbs?—Yes.

21,389. Have you attributed them to the faulty state of the ladders?—Yes, in a great measure.

(E e^{w}.) *Fall of Stone or Kibble.*

(e^{w}.)—FALL OF STONE OR KIBBLE.

Mr. Peter Parry.

20,488. (*Mr. Holland.*) What was he killed by?—He fell down a shaft by going down in a kibble.

20,489. At what mine was it?—Axton Mine, parish of Llanasa.

20,490. Have you had other such inquests as that?—Yes, several; there were three going down in this case, the men's hand slipped, and he fell to the bottom.

20,491. From the kibble?—Yes; there were three in the kibble.

(E l^{w}.) *Water in Mines.*

(l^{w}.)—WATER IN MINES.

Mr. Peter Parry.

20,484. (*Mr. Holland.*) Do fatal accidents occur among miners?—An accident occurred and 16 miners were killed at Bryngwiog Mine, near Halkin Mountain, in Halkin parish,

20,485. What caused their death?—An overflow of water; it came down in torrents upon them, and drowned them all from the old workings.

20,486. How long ago was that?—I think it was on February 12th, 1862, inquests concluded March 6th, 1862.

Capt. Francis Evans, Bryngwiog Mine, &c.

20,642. (*Mr. Kendall.*) Did any accident occur in consequence of your not having those plans to refer to?—Yes; the first extended on the 52 fathoms level west.

20,643. How far did you extend?—About 80 fathoms.

20,644. Why did you stop then?—Because we were afraid of the old mine water.

20,645. Then you commenced driving on the 66 fathoms?—Yes.

20,646. How far did you extend?—About 60 fathoms.

20,647. What occurred then?—We broke into the old mine.

20,648. You suddenly came upon water?—Yes; and in consequence 16 men were drowned.

20,649. Having extended about 80 fathoms on the 52, I suppose you thought you were quite safe in going as far as that on the 66?—Yes; and that came out in evidence on the coroner's inquest.

20,650. Can you explain why you should happen to tap the water on the 66 fathoms level?—The old men found a bunch of ore on the 52 fathoms level, and they followed it down in a diagonal direction, going east; and, besides that, the level from the old mine was driven further east than people generally said, and there were no plans to show the exact state of the underground workings.

Mr. William Henry Paull, Gogmau Mine.

22,153. (*Sir P. Grey Egerton.*) Is it a wet mine or a dry mine?—It is not particularly wet.

22,154. How do you get rid of your water?—By pumping.

22,155. Not by an adit level?—It is drawn up to the adit level.

22,156. Where does your water accumulate?—In both shafts, from the 140 up to the 120, and then it goes back to the next shaft.

(E m^{w}.) *Coroners' Inquests.*

(m^{w}.)—CORONERS' INQUESTS.

Mr. Peter Parry.

20,481. (*Mr. Holland.*) You are the coroner for this district?—I am coroner and a general practitioner; I have been coroner for 47 years; I am the oldest coroner in England.

20,482. How many inquests have you held?—I have held 3,256 inquests in this county, besides having acted in Denbighshire upon two occasions, upon the death of one and the removal of another coroner. I held last year 99 inquests in this small county and 28 adjournments; most of the adjournments were in colliery cases.

(E n^{w}.) *Plans of Mines.*

(n^{w}.)—PLANS OF MINES.

Capt. Francis Evans, Bryngwiog Mines, &c.

20,651. (*Mr. Kendall.*) Do you not think that it would be very desirable that it should be enforced that all parties should keep plans of mines?—I think that it ought to be done.

20,652. So as to be accessible in case of workings being renewed?—Yes; every mine which is abandoned should have a complete plan.

20,653. There should be a place of a deposit for plans?—Yes.

20,654. In fact, if there had been a working plan of the old mines left, this accident never would have occurred?—It could not have occurred. We keep up our plans.

20,655. As far as working plans go of the modern workings, are they generally adopted throughout this country?—No, they are not, as far as I see.

(F^{w}.)—CHANGING HOUSES.

(F^{w}.) *Changing Houses.*

Capt. John Darlington, Minera Mine.

19,891. (*Chairman.*) Do the men when they come to the surface, change in the boiler house?—I very unfortunately made an oversight the other day when your lordship was there in not showing you the place where they shift their clothes; we have a very nice place—indeed we have nice places.

19,892. Is it large enough for all the men?—Yes; we have 355 men, and I think that you would never see better accommodation for shifting.

19,893. Do they all go from the different parts of the mine to that place?—No.

19,894. They do not all make use of it?—No.

19,895. You have smaller ones?—Yes.

Capt. Edward Williams, Park Mines, &c.

19,947. (*Chairman.*) Have the men any changing houses when they come to the surface?—Yes, we have changing houses by all the shafts.

20,005. (*Mr. Holland.*) Have you seen cases in which men have suffered very much from cold after coming out of the mines?—Yes, when the weather on the surface is very cold, and the exertion on coming out of the mine is very great, particularly in the case of old miners.

20,006. Have you seen their clothes freeze on them?—Yes, at the new shaft which you saw yesterday. I have seen the men come up and their clothes actually freeze on them before they could reach the cabin.

Capt. Joseph Ninnis, Maes-y-safn Mine.

20,415. (*Chairman.*) I think that you have not put up any changing houses yet?—No.

20,416. Did you know a case where a man suffered before you came there?—I was informed so by the men.

20,417. What was it?—That a man came one morning, and his underground trousers were frozen so stiff, that they could stand up, his partners tried to persuade him not to go down in them, he said "nothing will hurt me." He came up and took cold, and was in his grave about two months after that, so I was informed.

20,418. So that you consider changing houses very important?—Yes.

Capt. Francis Evans, Bryngwiog Mine.

20,663. (*Sir P. Grey Egerton.*) Have you any dry provided for them?—Yes, we have three houses, but they generally come from home in their underground clothes.

Capt. William Bowen, Talargoch Mine.

20,873. (*Chairman.*) Where do the men change when they come to the surface?—In the cabins here.

20,874. Do they change in the boiler house?—No, we do not allow them to go there.

20,875. You have rules against it?—Yes, they are not allowed to go there unless sometimes their clothes are very wet, and they cannot dry them quick enough, and a man goes to lay them there and fetch them from there. We have a cabin here heated with pipes coming underneath the boiler.

20,876 Do they change their clothes when they come up?—Yes, in the cabins, but not in the engine house—they dare not go there.

20,877. Do those who reside near change at home, or do they still change in the cabins?—A great many of them go home to change, those who are close by; they prefer going home to stopping here.

20,878. But they have an opportunity of changing here?—Yes.

20,974. I see that by another rule there is a fine of 2*s.* 6*d.* for any man drying his clothes in the engine or boiler house; is that rule enforced?—Yes; but we have had no occasion to enforce it; they dare not go there, for if they did go they would be in danger, worse than the fire, of losing their work.

20,975. In fact these rules and regulations are rather to frighten the men?—Yes, we seldom fine them for anything, we only give them a good scolding and let them go.

20,976. As the men are not allowed to change their clothes in the boiler or engine-house, have you any means provided, by which they can dry their clothes?—Yes, we have a flue coming underground, and there is a damper to make it hotter or otherwise, as is necessary.

20,977. And you find that sufficient, so that the men find their clothes perfectly dry on coming up?—Yes.

20,978. Have you any water for the men to wash in?—They will not do it; we have provided a very good bath for the men, but not one of them will go into it.

Capt. Matthew Wasley, Coed Mawr Pool Mine.

21,096. (*Sir P. Grey Egerton.*) Are the men in the habit of changing their clothes when they come to the surface, or do they walk home in their mining clothes?—A great many of them who work in dry places walk home in their clothes.

21,097. Have you any place for them to dry their clothes?—Yes; and we keep a boy to watch the clothes.

21,098. Is the place heated?—Yes.

Capt. William Vivian, Parys Mine.

21,156. (*Chairman.*) Do the men change when they come to the surface, or do they go home?—They go home to their houses.

21,157. Have they any means of changing here if they wished it?—There never has been such a provision in this mine, and we should have entirely to change the system to introduce it. Welshmen, living as they do within a very short distance and the mine being dry, always prefer changing in their cottages.

Capt. Richard Ridge, Rheidol Mine.

21,518. (*Chairman.*) Do the men change when they come to the surface, or change at home?—They change at home generally.

21,519. Is there any provision at the mine for their changing when they come to the surface?—No; they generally come in the clothes which they wear, and go back in the same; it is generally the case in our mine, because it is generally a dry mine.

Capt. James Raw, Cwm-Ystwith Mine.

21,593. (*Chairman.*) Do the men change when they come to the surface?—No, they go home mostly; we have a changing house, but they mostly go home; they live very close in the neighbourhood.

Mr. Rowland Rowland.

21,878. (*Chairman.*) Do you think that they are more likely to get cold on coming to the surface?—It is their own fault. I think that they do get cold, I have known many instances where they have done so. The mines provide a changing room for them, and from the smith's shop there are large pipes to throw their clothes over, but lately the people have wanted to throw something over their wet clothes and go home as they are: they would rather change at home. They have not attended to that as much as they might have done.

21,879. And therefore the state of their health predisposes them to cold if they do not take care?—Yes, if they do not take care.

21,880. (*Mr. Holland.*) Are the men often hot as well as wet when they come up from the mine?—No, these mines are not hot.

Capt. Thomas Henwood, Snailbeach Mine.

22,320. (*Chairman.*) Do they change when they come to the surface?—Yes.

22,321. Where do they change?—In the cabins or barracks near the shaft.

22,322. Do they ever change in the boiler-house?—No, that is strictly prohibited.

Capt. Richard H. Vivian, Roman Gravels Mine.

22,557. (*Chairman.*) Have you a changing-house?—No.

22,558. Where do the men change?—Over the boiler.

G^{v}.) *Wages*
nd Deductions.

(G^{v}.)—WAGES AND DEDUCTIONS.

Capt. Francis Evans, Bryngwiog Mines, &c.

20,560. (*Mr. Kendall.*) What are the average wages of the miners here?—They do not work at all under 15*s*. a week; I think that they get that throughout the country.

20,561. Working five hours a day they get equal wages to the Cornish men who work eight hours?—Yes, they get even better wages; they strike if they do not

Mr. James Williams.

20,832. (*Mr. Leveson Gower.*) Are their wages low?—The work is very precarious; I believe they average about 15*s*. per week, but sometimes they make more or less, according to their contract with their employers.

20,833. In the course of the year do not they get higher wages than the agriculturists?—Yes; I should say they do.

20,835. Are they an improvident set?—As a class I do not think that they are improvident; but only getting wages about once a month they have no notion, I think, of laying them out to the best advantage.

Capt. William Bowen, Talargoch Mine.

20,903. (*Mr Kendall.*) What do you allow them to earn during the month?—15*s*. a week is our average rate, but they have been getting up as high as 100*l*. in a month. We let it at so much a ton. We say "You shall have 5*l*., 6*l*., 7*l*., and 8*l*. a ton, and you may get as much as you like."

20,904. They sometimes get into a bunch?—Yes.

20,905. Taking the average do you think that they get more than 3*l*. a month per man?—Yes, it will do more than that all the year round.

20,906. Are the men here provident and sober, do they save money?—Many of them have saved a good deal of money.

20,907. Do they put it in the savings bank?—Yes; they have bought ground

20,908. And have built houses?—Yes, several have gone very large farmers from here.

Capt. Richard Ridge, Rheidol Mine.

21,507. (*Chairman.*) What are the earnings of the men?—On the average about 12*s*. 6*d*. and 15*s*. a week.

(G d^{v}.) *Month in Hand.*

(a^{v}.) MONTH IN HAND.

Capt. John Darlington, Minera Mine.

19,909. (*Chairman.*) Is a month kept in hand?—There are about nine or ten days in hand.

Capt. John Floyd, Westminster Mine.

20,202. (*Chairman.*) Do you keep a month in hand of the pay?—Yes.

Capt. Henry Thomas.

21,661. (*Chairman.*) In the mines under your charge is the pay of the men always once a month, with a month in hand?—Yes.

Capt. Robert Northey, Bwlch Consols Mine.

21,788. (*Chairman.*) How is the pay of the men, is it a month in hand?—A month in hand.

(G e^{v}.) *Men Spaled or Fined.*

(e^{v}.)—MEN SPALED OR FINED.

Capt. W. Bowen, Talargoch Mine.

20,968. (*Sir P. Grey Egerton.*) Are your rules and regulations strictly enforced?—We do not enforce them very strictly; we do not press upon the men too hardly; as long as they will behave themselves and attend to their work we very seldom interfere with them; we ask them to come and do a proper day's work, and they do as they like.

20,969. When you do enforce the rules, what means do you take for that purpose—by fines or dismissal?—We very seldom make them pay; and if we do we keep it just to pay the doctor, or something of that sort.

20,970. I see that for certain transgressions there are fines enforced?—Yes.

20,971. How do you apply that money?—We have never had any money for anything except for drinking—a few half crowns—and then we pay it over to the doctor, or give it to some of the men who are sick or have been crippled in the mine, and so on, if they are poor.

(G e^{v}.) *Men Spaled or Fined*

20,972. I see that by the first rule the men are obliged to relieve one another at their place of work?—Yes, but they do not do it

20,973. That rule is not enforced?—No, nothing to compare to it.

Capt. Thomas Henwood, Snailbeach Mine.

22,327. (*Sir P. Grey Egerton.*) Have you a code of rules for the observance of the miners?—Yes.

22,328. Are they strictly enforced?—Yes.

22,329. How do you enforce them, by means of fines?—Fines. Each shift lost subjects a man to a fine of 2*s*. 6*d*., and if absent from work three days in any one month he is liable to dismissal.

22,330. How is that money disposed of?—It goes to the sick club.

(G f^{v}.) *Paying in Notes.*

(f^{v}.) PAYING IN NOTES.

Capt. John Darlington, Minera Mine.

19,910. (*Chairman.*) Do you pay in notes, or in small change?—All in gold and silver and in pence; we never pay anything like a note

Capt. John Floid, Westminster Mine.

20,203. (*Chairman.* Do you pay in notes, or in small change?—In gold and silver.

Capt. William Bowen, Talargoch Mine

20,896. (*Chairman.*) Do you pay in notes or gold or silver?—In silver and copper as much as we can for the convenience of the men, to save their going to the public houses, but in notes for tradesmen and so on. We mostly pay the men in gold and silver.

20,897. You think that that is a good plan?—Yes, the men settle on the surface, and it saves their going to the public houses.

Capt. William Vivian, Parys Mine.

21,170. (*Chairman.*) Do you pay in notes, or in gold and silver?—Always in gold and silver.

21,171. So that the men can divide it amongst them?—Yes, they have the opportunity, and many of them do divide on the mine.

Capt. James Raw, Cwm-Ystwith Mine.

21,603. (*Chairman.*) Do you pay the men in notes, or in silver and gold?—In silver and gold.

Capt. Thomas Henwood, Snailbeach Mine

22,333. (*Sir P. Grey Egerton.*) Where do you pay the miners?—At the office near the mine.

22,334. Is it near a public house?—No, it is half a mile from a public house.

22,335. Do you pay them in notes, or in gold and silver?—In gold and silver generally, to avoid the men going to the public house.

Mr. John Job, Snailbeach Mine.

22,480. (*Mr. Holland.*) Do you consider the miners steady class of men now?—Yes.

22,481. Are they more steady than they were some years ago?—Yes, from what I learn. I have only been here the last six years.

22,482. They are more steady now than they were reported to be some years ago?—Yes.

22,483. To what do you attribute that change?—Formerly the payment was partly by notes, and when we saw an evil created by paying the men in notes through their having to go to the public houses to get them cashed, we adopted the mode of payment by gold and silver. For the last three or four years we have not paid the men a single note that I am aware of.

22,484. Have you had any riotous behaviour on the pay day since you adopted that plan?—Not that we are aware of amongst our own men, but we have found that some of the colliers have mixed themselves with our men and created riots, which I believe our men have not been at all willing to engage in.

22,485. (*To Captain Evans.*) Do you confirm that opinion?—Yes. There is a wonderful change in this country compared with what there used to be formerly.

22,486. Is there much trouble in adopting that principle of paying every individual man in gold and silver?—

.) Paying

(*Mr. Job.*) We do not pay every man separately, but every taker of a bargain; we give him gold, silver, and copper, and then he goes and settles with his partners in that bargain, and since having paid them in coin we find that the majority of our men settle with each other on the mines instead of going to the public houses as formerly to get their notes cashed.

22,487 Are you always able to give them such money as they can easily change among themselves?—Yes, we endeavour to have it from the bank.

22,488. Is it a matter of much trouble to you to accomplish that?—No, it is merely an arrangement at the bank.

22,489. Does it involve any expense to you?—No.

22,490. It is no expense and but little trouble?—Just so.

22,491. Are you aware of any reason why that plan should not be generally adopted?—Not otherwise than that it may create a little objection on the part of the banking companies to offer gold and silver at the time of pay, because they prefer issuing their notes But if an arrangement can be made there cannot be any difference.

22,492. The banks which issue local notes might object?—I cannot say that they would object, but they might prefer issuing their notes.

22,493. On the part of banks which do not issue notes there would be no reason to object at all?—No.

22,494. Would it not give some trouble to the banks to provide the mines with such large quantities of small money?—We have not heard of anything of the kind.

22,495. They make no objection to it?—None whatever.

22,496. And they make no charge for doing it?—No.

22,497. And you consider the practice of very great advantage to the working classes?—Yes, and if it was universally adopted it would be better.

(*Captain Evans.*) This plan of paying in small money is one of the great reasons of the men's improved sobriety.

.) Small

(kw.)—SMALL WORKINGS.

Mr. George Hughes.

20,331. (*Chairman.*) I believe that you are the mining agent for the Marquis of Westminster?—I am.

20 332 You have the letting of the sets?—I have.

20,333. Will you describe to the Commissioners the mode in which you let them, whether for long or for short periods; are there a number of small sets let?—There have been a great many, but there are not so many now.

20,334. Those small sets are let for how long?—They are annual grants renewable every year.

20,335. Other sets are let to adventurers for a period of years?—Yes, the smaller grants are swallowed up in a great measure by the larger ones now, for which leases are granted for periods of 21 years. The present terms are 20*s.* a ton for a twelvemonth, renewable every first Monday in May; but I have very few of the smaller grants now.

20,336. You have a book showing the mode?—Yes (*producing a book*).

20,337. Has this system gone on for some time?—Yes; this system of letting has been going on for many years. They are on strings or veins which are numerous, close together, and bear shallow They are generally let in small patches of 60 yards by 30, which they call two meres of ground.

20,338. Do the men who are working in other mines take any of these small sets?—Yes; that is almost invariably the case.

20,371. (*Mr. Kendall.*) In these small workings do the men sink deep at all?—No.

20,372. How deep do they ever go?—They start from the surface.

20,373. And how many yards down do they go?—It depends upon circumstances.

20,374 What is the deepest?—Our district will not I think pay for working above 80 yards deep. We have seen bunches. Rhosesmoor is an exception, because they did not find the lead ore there till they got 80 yards deep; it is the same range of bearing measures.

20,375. In these small workings, how far do they generally go?—From five and six up to 20, 30, and 40 yards down; if they get anything which makes it worth while, they go down after it.

(G k w.) *Small Workings.*

20,376. Do they ever work at risk to their health as regards ventilation?—I do not know that they do; the bearing is so shallow, that it will pay them better to sink a bit of a hole; they can do nothing if they have no air, and the expense is so trifling to relieve themselves of the foul air that it is easily adopted.

20,377. Can you sink at small expense?—Yes; I should think that you can sink at 10*s.* a yard, up to 20 yards deep in many places, except it is in rock.

20,378. How many men together generally take these little workings, two or three?—We generally let 60 yards by 30 for two, that is our rule, and I believe it is generally carried out.

20,379. I suppose that the same takers have the first chance on the set being again let?—We never take it from them as long as they wish to work it.

20,380. (*Sir P. Grey Egerton.*) Do both men of the pair work underground, or is one bringing out the ore and the other working?—They both work underground.

20,381. Till they have an accumulation of ore?—Yes, and then they get assistance to bring it out; they very often get a man at the top while they are both below; if they can manage without assistance they do.

20,382. Do they dress the ore themselves, and prepare it for the market?—Yes; sometimes when they are not used to it they get a man to finish it.

20,383. Have you any check upon them?—Yes.

James Goddard

20,690. (*Mr. Kendall.*) Have you a rich vein now?—Yes, very rich.

20,691. And you hope to make money now?—Yes.

20,721. Do you know any men who work some time in the day in a regular mine, and then work at their own mine afterwards?—We have been so.

20,722. What was your last call?—16*l.*; 20*s.* a share.

20,723. Did you work up your 20*s.*?—Yes.

20,724. Did you work it up all at once?—No.

20,725. You did it by degrees?—I have to pay my call every month

20,726. You work up your call every month?—Yes.

20,727. And you receive the difference?—Yes.

20,728. Supposing that at the end of your month you had earned 5*l.*, you would only receive 4*l.*?—Yes.

20,729. When poor men have these mines there is no overlooker or captain, is there?—Yes there is a man to look over.

20,730. You appoint a man among yourselves?—Yes.

20,731. Is he a working man also?—Yes.

20,732. Generally, when poor men have works of their own, they are their own masters; there is nobody to interfere with them; it is their own property, and there is nobody to say that they shall do this or that?—Just so.

20,733. (*Mr. St Aubyn.*) They can change their captain whenever they please, cannot they?—Yes.

20,734. Has he anything extra for being overlooker?—Yes.

Dr. Jesse Conway Davies.

20,776. (*Mr Leveson Gower.*) Have you had more cases from certain mines than from others?—I could not say so as regards any of the public mines; but small mines, small ventures, and so on, where, perhaps four or six men are working in their own mine, are, I think, the worst ventilated. There was an instance here the other day: two men were working in the bottom of a shaft, but the air was very bad, so that they could hardly breathe, but they had heard from somebody that if they had a stove in the shaft it would cause a better ventilation, and they took a stove down to the bottom of the shaft, and of course it had not been there above three or four minutes before they both fell senseless at the bottom of the pit.

20,777. (*Mr. Holland.*) Do you mean a stove without a flue?—I do not know what kind of stove it was. Of course that destroyed the oxygen, and converted it into carbonic acid gas at once, and the man could not breathe and they fell senseless. Of course the fire went out directly that the oxygen was exhausted. I suppose that it must have been the heat from the stove that caused a little disturbance in the air of the pit, so that oxygen replaced some of the foul air where the men lay, or otherwise they would both have been dead.

(G^{w}.)—WAGES AND DEDUCTIONS.

k^{w}.) Small Vorkings.

Mr. Edwin Aspinall Beach, Coed Mawr Pool Mine.

21,007. (*Chairman.*) Besides that have you other mines let to poor men?—Yes.

21,008. On what terms do you let to poor men?—Exactly the same as we do to others.

21,009. For one tenth?—Yes.

21,010. But not so long a lease?—Yes; we give them a lease of 20 or 21 years, I forget which. We first of all give them a take note of three years, and at the expiration of three years they are at liberty to take a lease or abandon the works.

21,011. How many have taken leases after they have had take-notes in the last 12 takes; half?—More than half.

21,012. How long have you been agent here?—I have been here about seven years.

21,013. From what you have learned and from what you have known by your own experience, do you think that the letting of these small mines is advantageous or disadvantageous to the possessor of the soil?—I think that it is a great disadvantage to the possessor of the soil.

21,014. Why do you think that it is a disadvantage?—I think that the workings are spoilt by small takes,—and having small miners—nothing but labouring men working them. They have not the means of working them properly, and they grub the lead from the surface and spoil the workings for large companies when they come in.

21,015. You do not think that they are pioneers for large companies, and make discoveries for them?—They do in some measure.

21,016. Supposing that a poor man were to make a discovery, how would you manage unless you did give him a take-note?—I cannot say, but I think he ought to be protected in some way.

21,017. But nothing of that kind has occurred as yet?—No.

21,018. That is the system which you would recommend?—Yes.

21,019. You do not speak as to the working of the mines at all?—No.

(m^{w}.)—PAYMENT OF WAGES.

m^{w}.) Payment Wages.

Capt. Francis Evans, Bryngwiog Mine, &c.

20,557. (*Chairman.*) Have you a month in hand of the pay?—No, we only keep a fortnight, at some of our mines we only keep a week; but I think that a fortnight is the time which ought to be allowed.

20,558. You think that it is quite possible in mines to pay, only keeping a fortnight in hand?—Yes; I think that a fortnight is quite long enough; I should say that there ought to be a fortnight, and that a fortnight ought to do.

20,559. Would a month in hand lead the men to be more in debt?—I should think that a month was too much, generally speaking, unless it was a very large establishment.

Capt. William Bowen, Talargoch Mine.

20,891. (*Chairman.*) How often are the wages paid?—Monthly.

20,892. How much do you keep in hand?—Our settling day terminates on the last Saturday in the month, and we pay them on the first Saturday after the second Thursday in the month. The sale of ore is on the second Thursday.

20,893. They are paid within a fortnight?—Yes, and sometimes less and sometimes more; it is just according to how the month terminates.

Capt. William Vivian, Pary's Mine.

21,169. (*Chairman.*) Do you keep a month in hand?—A fortnight; the pay is always a fortnight after the taking expires.

Mr. Thomas Evans, Mona Mine.

21,447. (*Chairman.*) How often are the men paid?—Monthly.

21,448. Do you keep a month in hand?—No, we only keep a certain portion in hand. We give them subsist as far as we can at the end of the month, and then give them the balance at the end of the following month.

21,449. But there is a month in hand?—No; we give them a subsist.

21,450. But they are not settled up with for a month?—No, we are not able to do it.

(Gm^{w}.) Payment of Wages.

Mr. John Hughes.

22,284. (*Chairman.*) At the Gravels mines do they pay the men in the vicinity of a public house?—Yes, at the next house but one, and the men always go in to change.

Capt. Thomas Henwood, Snailbeach Mine.

22,331. (*Sir P. Grey Egerton.*) How often do you pay the men?—Once a month.

22,332. Do you keep a month in hand?—About a fortnight in hand. We set generally for two months; we subsist them one month, and balance them off at the end of the second month.

22,405. (*Mr. Kendall.*) Your pay-day is once a month?—Yes.

22,406. On Friday?—Yes.

22,407. What becomes of the Saturday?—We always allow the men the Saturday to go to market to lay out their money to the best advantage.

22,408. They have a whole holiday once a month?—Yes.

22,409. Supposing a man has any particular business which he wishes to transact, or any family matters that he wishes to stay at home to attend to, do you allow him to stay at home?—Yes, provided he asks leave.

22,410. What has he to pay the man who takes his place, provided he is in a corps?—3s. per shift.

22,411. How frequently do you permit that, once or twice in the year, or more?—Occasionally.

(n^{w}.)—NON-PAYMENT OF WAGES.

(G n^{w}.) Non-payment of Wages.

Mr. John Graham Williams.

21,963. (*Chairman.*) They were from miners complaining of the non-payment of the sums earned by them in working in the smaller mines?—The complaint, I believe, was of the great difficulty in obtaining their wages.

21,964. I believe you also wrote to Lord Palmerston and to the Home Office?—I did. Last year I wrote to Sir George Grey; last June, I think it was.

21,965. Does that state of things exist generally throughout the mines, or are there exceptions?—There are exceptions.

21,966. What are the exceptions?—The exceptional mines are all those worked by the Messrs. Taylor; they are most regular and punctual to the hour, and as far as I have ever heard, they have never missed one payment since they commenced working the mines in this part of Cardiganshire.

21,967. Then I suppose it is the smaller companies whose payments are so irregular?—It is the smaller companies.

21,968. Where this has happened, have the mines been worked for some time, or are they very recent?—They are very ancient mines.

21,969. And they have been working?—Continually working, the lessees changing occasionally.

21,970. Has the system of non-payment or irregular payment been a general practice, or is it a new thing which has arisen lately?—I believe that it has increased considerably within the last 10 years.

21,971. I believe you can bring witnesses before us from amongst the men who can speak to that point?—I can.

21,972. Have any means been taken to recover the wages by the men?—Yes, there have.

21,973. Have they succeeded?—In some instances, and in many instances at a loss; in fact, the opposition on the part of the directors has been very great, they throwing themselves into bankruptcy and saying "We are too poor."

21,974. (*Mr Holland.*) The opposition would be on the part of other creditors, would it not?—Yes, as well as the directors throwing themselves into the Court of Bankruptcy.

21,975. (*Chairman.*) Is there any particular case where you know that large sums have been due to the men and yet they have not been able to recover them?—Yes, particularly in respect to a mine called the Darren Mine. It is one of the oldest mines which we have in this country. It was worked by Sir Hugh Myddleton and Sir Humphrey Mackworth. This is a list which was furnished to me by Mr. Hugh Hughes, the Solicitor of Aberystwith, in whose hands these poor people have placed themselves, to try to recover their money. Some of these men I can produce before you.

21,976. What is the total amount due?—According to the list now in my hands it amounts to 508*l.*

(*The witness delivered in the following paper.*)

($F d^{v}$.) *Non-payment of Wages.*

BALANCE of WAGES due to the Miners of the "Great Darren Mine," July 1862.

	£	s.	d.
William Vaughan and partners	24	17	8
David Vaughan and partners	38	6	2
William Edwards and partners	5	6	3
David Edwards and partners	16	14	4
David Edwards, labourer	5	0	10
John Jenkins and partners	43	13	2
John Lewis and partners	15	12	4
John Morgan and partners	6	7	2
John Edwards and partners	11	5	11
Jenkin Edwards, labourer	0	14	0
Joseph Greavies, labourer	1	13	8
John Nicholls, miner	17	4	7
William Lewis, miner	8	0	8
James Lewis, miner	10	6	8
John Vincent, miner	15	3	8
Evan Lewis and partners	37	12	0
James Lewis and partners	20	16	0
David Mason, labourer	2	5	0
Isaac Mason and partners	15	0	0
John Jones and partners	11	2	9
Thomas Jones, labourer	2	2	0
Richard Evans, miner	6	10	0
Thomas Rodenett, miner	7	15	2
Thomas Allen, miner	2	2	11
Ann Thomas, ore washer	1	1	3
John Oram, miner	6	13	0
John Lewis, smith	16	8	4
Lewis Samuel, carpenter	15	1	4
Evan Jones, carpenter	6	7	0
John Owens, carpenter	2	16	8
John Hughes, cooper	7	0	0
Elizabeth Morgan, widow, horses drawing at the whimsey	28	5	6
Ann Evans, widow, for drawing timber to the mine	30	19	6
Isaac Jones, ore carrier	16	7	6
Morgan Morgan, ore carrier	9	7	2
Boys and girls, washing ore in the months of March, April, and May	42	2	11
	508	3	1

21,977. Those men have no means of recovering in the county court?—The expenses incurred in the county court are so heavy that it deters them from taking proceedings.

21,978. Are you aware whether these men are induced to work notwithstanding the uncertainty of payment, by the offer of higher wages?—That I cannot say, further than at the expiration of the month they ought to be paid, but no money comes down. The agent says "Carry on for another week or fortnight; the money is sure to come down."

21,979. And so they are induced to work on?—Yes; and perhaps instead of 100*l.* or 150*l.* coming down, they will send 20*l.*, and it must be distributed in shillings amongst the men to keep them quiet.

21,980. (*Mr. Holland.*) To keep them alive?—Just to keep them alive.

21,993. What remedy would you suggest for the evil which you have described as to the recovery of the wages?—I have had a great deal of conversation with several parties in this neighbourhood and one or two of our attornies upon the subject, and the most effectual way which they can think of is this, that when a mine is wound up in the Court of Bankruptcy the first call should be to pay off the wages of the working miner.

21,994. The wages in full before any other claims?—Yes, inasmuch as the other claims are generally put in by the wealthy merchants who supply, we will say, timber, &c. They get great profits upon the articles which they supply, particularly if it is a doubtful mine, because they charge so much more; they can afford to wait a little longer than the poor working miners, who depend entirely upon their daily labour for their wages.

21,995. Would you also propose that they should have the power of the recovery of their debts before a magistrate before winding up, as domestic servants have?—If the law would enable them to do so, it would be a beneficial thing.

21,996. Domestic servants have that power up to 5*l.*, would you propose that also?—If the law could be so altered it would be very beneficial to them, because now t is not the directors of these small mines who are working the mines, it is the small shopkeepers in the ntry, of whom I can bring before you one or two who have been ruined. They have suffered to such an extent, that instead of being shopkeepers, they are now working miners themselves.

21,997. Are there many of these sufferers on the parish?—There are a great many.

21,998. To such an extent as to be a real burthen to the parish?—We feel it very much. We have seldom a meeting of the Board of Guardians without some poor miner or his family coming for relief.

21,999. (*Sir P. Grey Egerton.*) The case which you have brought before us is a case of bankruptcy?—Yes, of winding up in the Court of Bankruptcy.

22,000. Can you give us any instances of solvent mines where the wages are in arrear to such an extent that the men have complained?—Yes; the mines worked by Mr. Murchison, what are called Nanteos and Penrhiw.

22,001. To what extent of arrears do they run there; I do not mean in money merely, but in time?—Three or four months.

22,002. In the cases of solvent mines, have not the miners a remedy by going before a magistrate for the recovery of their wages?—If they have, we are not aware of it in this neighbourhood; it has never been tried.

22,003. (*Mr. Kendall.*) Are you aware that so far as the recovery of wages goes, there is a distinction between miners who work on tribute and tut-work and those who work by the day?—No difference has been made in this nighbourhood which has come under my knowledge.

22,004. You are not aware that if a miner has daily wages he can recover before magistrates in Petty Sessions as far as 5*l.*; but that if he works on bargain work he cannot recover?—I am not aware of that.

Mr. JAMES GARLAND, East Darren Mine.

22,178. (*Chairman.*) You are aware that a petition was presented from this quarter from men who had not been paid their wages?—Yes.

22,179. Do you know that to be the case?—Yes. I have a list (*producing the same*). Those are the names and here are the bills and everything to correspond.

22,180. The list which you give in contains the names of men who are owed money, and the names of the mines are also given?—Yes.

(*The witness delivered in the following paper.*)

Court Grange Mines' Pay for May 1855.

	£	s.	d.
To Evan Evans, for stoping, &c.	2	10	8
To Evan Evans, ditto, for June month	6	17	6
Llely Evanhon Mine.			
To David Morfans, for 4 months' labour	13	7	0
Abernant Mines Company.			
To Richard Pearce	2	17	6
Great Darren Mine.			
To John Vincent, for 5 months' labour	15	3	8
To Thomas Roderick, for 84 days' work	7	15	2
To John Morgans, for 2 months' labour	6	7	2
To Ann Thomas, for labour	1	12	3
To Thomas Allen, for 2 months' labour	2	2	11½
Blaen Ceilan Mine.			
To Isaac Jones Smith, 1 month	1	10	3
To Richard Jones	4	7	10
To Edward Jones, 1 month	2	15	7½
Willow Bank Mine.			
To John Mason	0	10	0
To Edward Edwards	0	10	0
To Evan Evans, for 7 days' work at 2*s.*	0	14	0
To Richard Davis and pair, January 1859, for driving	28	0	0
	97	1	7

22,181. Do you know any mine where on the last pay day there was no pay?—There was a mine, but it has paid since your lordship was here, it was a fortnight after the time; 97*l.* 1*s.* 7*d.* is the amount of money owing at the mines in the list which I have handed in.

22,182. These mines are still being worked?—They are now working, but the pay has not been regular.

22,183. You have heard complaints from men on that subject?—Yes, since 1855.

(I^{w}.)—CANDLES.

Capt. John Darlington, Minera Mine.

19,902. (*Chairman.*) What do the men pay for candles?—About 6*d.*

Capt Edward Williams, Park Mines, &c.

19,948. (*Chairman.*) What quantity of candles are the men allowed?—Generally speaking one set of 6 men take 12 lbs. every week.
19,949. What are they charged for the candles?—About 6*d.* to 6½*d.* per pound; they vary; there is a small profit on them.

Capt. John Floyd, Westminster Mine.

20,193. (*Chairman.*) What is the price charged?—8*d.* a lb. we charge the miners.

Capt. Joseph Ninnis, Maes-y-safn Mine.

20,410. (*Chairman.*) What are they charged for them?—Eightpence.

Capt Francis Evans, Bryngwiog Mine, &c.

20,555. (*Chairman.*) What do they pay per pound?—We charge them 8*d.*

Capt. William Bowen, Talargoch Mine.

20,868. (*Chairman.*) What are they charged for the candles?—Just according to the price of them, 7*d.* we charge them now, I think.
20,869. And how much for powder?—Abont the same price.

Capt. William Vivian, Parys Mine.

21,160. (*Chairman.*) What do they pay for them?—8*d.* a lb. is the nominal price.
21,161. And the same for powder?—Yes.

Mr. Thomas Evans, Mona Mine.

21,444. (*Chairman.*) What allowance for candles per week have the men?—2 lbs. per week.
21,445. What is the price which they are charged for them?—1*s.* 2*d.* per lb.

Capt. Richard Ridge, Rheidol Mine.

21,510. (*Chairman.*) What are the men charged for the candles?—About 7*d.* the lb.

Capt. James Raw, Cwm-Ystwith Mine.

21,596. (*Chairman.*) What is the charge for the candles?—7*d.* a pound.

Capt. Thomas Ball, Lisburne Mines.

21,743. (*Chairman.*) What do the men pay for candles?—9*d.*

Capt. Nicholas Bray, Llwymnalees Mine.

21,823. (*Chairman.*) What do the men pay for candles?—I charge them 6*d.* per lb.

Capt. Thomas Henwood, Snailbeach Mine.

22,305. (*Chairman.*) What is the charge?—8*d.*

Capt. Richard Henry Vivian, Roman Gravels Mine.

22,518. (*Chairman.*) What is the charge to the men per lb. for candles?—8*d.*

(J^{w}.)—POWDER.

Capt. John Darlington, Minera Mine.

19,903. (*Chairman.*) And for powder the same?—Hardly that, the men pay exactly the cost price; the powder is 45*s.* a cwt.

Capt. Edward Williams, Park Mines, &c.

19,950. (*Chairman.*) And for powder 6*d.*?—Yes.

Capt. John Floyd, Westminster Mine.

20,194. (*Chairman*) And 8*d.* for powder?—Yes.

Capt. Joseph Ninnis, Maes-y-safn Mine.

20,411. (*Chairman.*) And for powder 8*d.*?—Yes.

Capt. Francis Evans, Bryngwiog Mine, &c.

21,556. (*Chairman.*) And 8*d.* for powder?—Yes; every mine has its different price generally.

Capt. William Bowen, Talargoch Mine.

20,868. (*Chairman.*) What are they charged for the candles?—Just according to the price of them; 7*d.* we charge them now I think.
20,869 And how much for powder?—About the same price.

Capt. William Vivian, Parys Mine.

21,160. (*Chairman.*) What do they pay for them?—8*d.* a lb. is the nominal price.
21,161. And the same for powder?—Yes.

Mr. Thomas Evans, Mona Mine.

21,446. (*Chairman.*) And how much for the powder?—1*s.* 6*d.* With regard to the powder and candles, the men get a certain price per ton for the ore, and they pay for the candles and powder nominally.

Mr. James Raw, Cwm Ystwith Mine.

21,597. (*Chairman.*) And what for powder?—8*d.*

Capt. Thomas Ball, Lishurne Mines.

21,744. (*Chairman.*) And what for powder?—8*d.*

Capt. Nicholas Bray, Llwynmalees Mine.

21,824. (*Chairman.*) And how much for powder?—6*d.*; it does not make any difference, because if we charged more for candles, we should have to give them so much more per fathom, to allow the men to have their wages.

Capt. Thomas Henwood, Snailheach Mine.

22,306. (*Chairman.*) And 8*d.* for powder?—Yes.

Capt. Richard H. Vivian, Roman Gravels Mine.

22,519. (*Chairman.*) And how much for powder?—8*d.*

(K^{w}.)—CLUBS.

Capt. John Darlington, Minera Mine.

19,904. (*Chairman.*) Is there any club attached to the mine?—They have a sort of club amongst themselves, but the sick clubs about are numerous.

Capt. Edward Williams, Park Mines, &c.

19,954. (*Chairman.*) Is there any accident club?—No, we have been very free from accident.

Capt. John Floyd, Westminster Mine.

20,195. (*Chairman.*) Is there any deduction for club?—No; we have no club now; we had a club until within the last 12 months.

Capt. Joseph Ninnis, Maes-y-safn Mine

20,419. (*Chairman.*) Do the men pay club money?—No; only the doctor; the men pay 6*d.* a month to the doctor.

) Clubs.

(K^{w}.)—CLUBS.

(K^{w}.) Clubs.

Capt. **William Bowen**, Talargoch Mine.

20,887. (*Chairman.*) Do they pay any club money, or is there any other deduction?—Nothing whatever, but I sometimes make a collection among the men in cases of necessity when somebody is very bad and very poor.

Capt. **Matthew Wasley**, Coed Mawr Pool Mine.

21,077. (*Chairman.*) Have they a club?—No.

Capt. **William Vivian**, Parys Mine.

21,163. (*Chairman.*) But is there any club belonging to the mine?—Yes.

21,164. What do the men pay to it?—6*d*. a month for doctor and club; we are obliged to be very economical; but that is all that we take out of their wages. The account of the club is scarcely thriving at present. We are obliged to borrow a little from the mine company; but we hope to make it pay at 6*d*. a month.

21,165. You keep a separate account?—Yes, and then when any accident occurs to injure a man, he has 5*s*. a week from that club.

Mr. **Thomas Evans**, Mona Mine.

21,468. (*Sir P. Grey Egerton.*) Do the pensions come out of the club money which the men subscribe?—They are paid by the general mine money.

21,469. (*Chairman.*) The men pay 1*d*. a week?—Yes. The club money is not nearly sufficient to pay it; it does not even pay the doctor's bill. There was an arrangement once made here by which the doctor got a stated sum per annum, but he was not found to be sufficiently attentive to the miners when that plan existed, and the system was altered.

Capt. **Thomas Henwood**, Snailbeach Mine.

22,311. (*Chairman.*) What is the amount of the club money?—Club is 9*d*. and the doctor 1*s*. per month.

) Doctors.

(L^{w}.)—DOCTORS.

(L^{w}.) Doctor .

Captain **John Darlington**, Minera Mine.

19,905. (*Chairman.*) Is there a doctor attached to the mine?—We have a doctor; indeed we have three, I think; the men make choice of their doctor; every man makes choice of his own doctor.

19,906. Is the sum which they pay to the doctor a fixed sum?—I think it is 2*d*. a head per month. I am not exactly sure; it used to be that.

19,907. But there is no account kept between you and the doctor?—No.

Captain **Edward Williams**, Park Mines, &c.

19,951. (*Chairman.*) Have you any doctor attached to your mine?—Yes, Dr. Jones, of Ruabon; the men pay 6*d*. per month each to the doctor's fund.

19,952. Do you keep the account of the doctor?—We keep the money.

19,953. The doctor is appointed by the adventurers?—Yes, and he has his medicine and surgery on the mine, visiting the works every week.

Mr. **Edward Davies**.

20,121. (*Chairman.*) What is the amount the men pay?—6*d*. each a month.

20,122. Is that for themselves?—For themselves and wives, except in midwifery cases.

20,123. (*Mr. Holland.*) Does it include their families?—No, only the husbands and wives.

Captain **John Floyd**, Westminster Mine.

20,196. (*Chairman.*) Is there any subscription for doctor?—Yes.

20,197. Is the doctor appointed by the adventurers?—By the adventurers and the miners. The miners pay 6*d*. per month each man.

20,198. Who has the choice of the doctor?—He is chosen by the men.

20,199. How is it managed?—It goes by vote. We let them elect their own doctor.

20,200. Have you done that for some time?—Yes, three years ago.

20,201. Did you make any change for any reason?—We made a change. One doctor that we had before lived in Mold, and the doctor that we have now lives at Ruthin. The men were dissatisfied that the doctor living in Mold did not attend regularly, and they wished to change, and we let them choose their own doctor.

Capt. **Joseph Ninnis**, Maes-y-safn Mine.

20,419. (*Chairman.*) Do the men pay club money?—No; only the doctor; the men pay 6*d*. a month to the doctor.

20,420. Is the doctor appointed by the adventurers?—Yes.

20,421. What is his name?—Dr. Hughes of Mold.

Capt. **William Bowen**, Talargoch Mine.

20,884. (*Chairman.*) Is there any doctor belonging to the mine?—No, they choose their own doctor; they prefer choosing their own doctor; there have been three or four doctors attending here. We have a place on purpose for the doctors to attend.

20,885. Is there any deduction for payment of the doctor?—The men pay themselves, quarterly.

20,886. Who collects the money and manages that matter?—The doctors themselves. There was a great dissatisfaction amongst the men—one was for one doctor, and another for another, and the secretary who was here before this gentleman could make nothing of them about the doctor's money as there was so much grumbling altogether—we therefore gave it up, and left them to pay their own doctor.

Capt. **Matthew Wasley**, Coed Mawr Pool Mine.

21,078. (*Chairman.*) They go to the doctor when they like?—Yes.

Capt. **William Vivian**, Parys Mine.

21,166. (*Chairman.*) Is the doctor appointed by the owners of the mine?—Yes, with the general consent of the men.

21,167. So that if the men objected to the doctor the owners would take it into consideration?—Of course they would. It is our object always to conciliate and to do the best for the men in that respect, and to meet their wishes as far as practicable.

Dr. **Thomas Hughes**.

21,261. (*Chairman.*) Are you the medical man appointed to attend this mine?—Yes.

21,262. And the Mona mine?—No only this mine.

21,263. How is the remuneration fixed?—I receive so much annually.

21,264. You look to the Company for payment?—Yes.

21,265. For that you have to attend the men and their families or only the men?—Only the underground men; it is only applicable to accidents.

21,266. There is nothing for sickness?—No.

21,267. Do you attend any miners for sickness?—Yes, most of them.

Mr. **Richard Lewis Parry**.

21,326. (*Chairman.*) Now the surgeon is appointed by the mine?—Yes.

21,327. And at the Mona mine the men choose their own doctor?—Yes.

21,328. How long has the system been changed at the Parys mine?—About nine months.

21,329. And the doctor is now appointed by the company?—Yes, and not by the men, but it is the men's money.

21,330. The men pay?—The men pay and the company keeps the money.

Mr. **Thomas Evans**, Mona Mine.

21,451. (*Chairman.*) Is there a doctor attached to the mine?—We have no appointed doctor.

21,452. What means have the men of medical attendance?—They choose their doctor, and the mine pays.

21,453. What do the men pay towards the doctor?—One penny per week per man.

(L^{w}.)—DOCTORS.

21,454. Is that for attendance for sickness, or for hurt?—Not for sickness; we do not pay for sickness.

21,455. Only for visible hurt?—for visible hurt, or internal hurt; any hurt.

21,456. Is the sum which the men pay towards the doctor sufficient to meet the doctor's salary?—We do not pay a regular doctor's salary. The men have their choice of doctors, and we pay them their bill; there is no arrangement.

21,457. Who is the doctor?—Any doctor the men may choose. Sometimes it is Mr. Parry, who was examined by you to-day.

Capt. Richard Ridge, Rheidol Mine.

21,511. (*Chairman.*) And what deduction is made for the doctor?—6*d.* per month.

Capt. James Raw, Cwm Ystwith Mine.

21,640. (*Sir P. Grey Egerton.*) The men pay 6*d.* a month to the doctor?—Yes.

21,641. And for that he attends to accidents as well as illness?—Yes.

21,642. Suppose that two of a family are employed in the mine, do they each pay 6*d.*?—Yes; father and son, if he is working underground.

21,643. If any of the children are working, do they pay 6*d.*?—3*d.* a month on the flooring.

21,644. And for that the doctor attends both the men and their families?—He attends the whole family for that.

Capt. Thomas Ball, Luburne Mines.

21,748. (*Chairman.*) Who is the doctor attached to your mine?—Dr. Rowland.

21,749. Is he appointed by the company?—He is appointed by the men, it is the men's choice.

21,750. What deduction is made from the men for the doctor?—Sixpence per man per month.

21,751. Does that include sickness as well as accident?—It includes the family.

21,752. Who keeps the account of the collection of the sixpences?—It is kept in the cost book, it is deducted from the men's wages and handed over to the doctor. It is 6*d.* only, nothing extra for attendance of families.

21,753. Is the account kept at the mine?—Yes, and it is deducted the same as any other material.

Mr. Rowland Rowland.

21,855. (*Chairman.*) Are the company responsible to you, or do the men pay you?—The company pay me.

21,856. They do not guarantee you a certain sum?—No.

21,857. How are you elected?—I was appointed by the company in 1841, and I have continued to attend the mines ever since.

21,858. Are there any other doctors resident in this district besides yourself?—There is no doctor resident in this immediate district but myself. My brother has the north side of this river, and this river is our boundary. My son assists me; he is a qualified practitioner.

21,859. By that arrangement do you attend the miners in case of sickness as well as accident?—Everything.

21,860. And their families?—Their wives in every case but midwifery, and I am paid only half a guinea for midwifery, because I am in the pay of the company.

Mr. Evan Rowland.

21,916. (*Chairman.*) Do you make the same arrangement with all?—Exactly the same with all of them.

21,917. Will you state what the arrangement is?—My arrangement with them is 6*d.* per head per month; that is my pay.

21,918. The company secures that to you?—Yes; I get it from them every month.

21,919. Does that apply to attendance for sickness as well as hurt?—It is for sickness as well as hurt; for the man who is working, but I am obliged to supply medicine for the wife and family, but no attendance.

Mr. John Hughes.

22,265. (*Chairman.*) How are you paid?—I am paid per head, 8*d.* per month for each man; and if the families are able to pay, I have 1*s.* a month and attend them, because they would come into my poor-law district if it were not for that.

22,266. (*Mr. Holland.*) For that you attend them whether they are hurt or ill?—Yes.

22,267. Have you been accustomed to a mining population before this?—Never.

22,268. Does it strike you that the mining population are decidedly weak in their lungs?—Yes, I think so.

22,269. As compared with others?—As compared with agricultural labourers.

22,270. Where have you practised before?—I have been at Bishop's Castle for the last four years.

22,271. Where is that?—About 10 miles from here.

22,272. Is it an agricultural district?—Yes, quite so. While I was there I had charge of the Gravels mine.

Capt. Thomas Henwood, Snailbeach Mine.

22,311. (*Chairman.*) What is the amount of the club money?—Club is 9*d.* and the doctor 1*s.* per month.

(a^{w}.)—APPOINTMENT OF DOCTORS.

(La^{w}.) *Appointment of Doctors.*

Capt. Richard Ridge, Rheidol Mine.

21,513. (*Chairman.*) Do the men choose their own doctor, or is he appointed by the adventurers?—He is appointed by the majority of the men.

21,514. Does any difficulty arise in that mode of appointment?—No, scarcely ever.

Capt. James Raw, Cwm-Ystwith Mine.

21,599. (*Chairman.*) Is he appointed by the men?—He is appointed by the miners themselves; they pay 6*d.* a month towards him.

21,600. Is that 6*d.* for illness as well as hurt?—It is for everything.

21,601. Does it include their families or only themselves?—Only themselves, but they mostly have families who are working on the surface, and the doctor mostly attends the whole family for it.

(b^{w}.)—POST MORTEM EXAMINATIONS.

(L b^{w}.) *Post Mortem Examinations.*

Mr. Thomas Taylor Griffiths.

20,069. (*Sir P. Grey Egerton.*) In case of death, what is the condition of the lungs after death?—I have had no opportunity of judging, owing to the prejudice here against post mortem examination; it is only very lately that a post mortem examination could ever be obtained, unless there was reason to state to the jury that there had been a want of proper treatment, or unless there was something upon a post mortem examination to necessitate a coroner's inquest; such a thing never occurred within my own experience.

Mr. Robert Parry.

20,513. (*Mr. Holland.*) What do you hold the disease to be that they suffer from?—We have never had an opportunity of a post mortem examination, but there is evidently a shortness of breath. I should say that it was chronic bronchitis, but they do not complain of acute pain; we do not see them then.

Mr. Rowland Rowland.

21,891. (*Mr. Holland.*) How long will they spit that particular sort of black spit after leaving the mine?—For days, and sometimes weeks, but the sputa of people who have been working in mines even for two years is rather darker than usual. From that kind of bronchitis which they have there is a darker sputa than we have in other people. I think that it is from some affection of the lungs. I have not had many opportunities of a post mortem examination, but it is a darker secretion.

Dwell.

(M^{w}.) *Dwellings.*

Mr. Edward Williams, M.D.

20,107. (*Sir P. Grey Egerton.*) Are the cottages of the miners tolerably comfortable and healthy ?—A great many of them live in their own dwellings, and are so.

20,108. Freehold ?—Freehold, in some cases I think, and speaking generally, a great many of them are tolerably clean, and being on the side of the hills which we have up at Minera, I should say that they are generally speaking pretty well ventilated. Taking them as a class of people, I should say that they are quite as well off in their dwellings as their neighbours under the same circumstances. I should say that they are better off than the colliers.

Mr. Edward Davies.

20,132. (*Chairman.*) With regard to the houses, are the men well lodged, generally speaking ?—The miners' houses round Minera are generally good houses, comparatively.

Mr. George Hughes.

20,384. (*Sir P. Grey Egerton.*) Are the cottages of the miners tolerably comfortable ?—Some of them are; I think that you will find them, for the most part, clean and tidy; they are chiefly cottages built by themselves; they are squatters; rather than get a comfortable good cottage for 2*l.* a year, which is our usual rent, a man would prefer spending 100*l.*, or the whole of his labour, let him be ever so lucky.

20,385. But whether they live in their own cottages, or lease them from Lord Westminster, you think that they keep them clean ?—Yes.

Capt. F. Evans, Bryn Gwiog Mine.

20,668. (*Sir P. Grey Egerton.*) About what distance have they generally to walk ?—They live within a mile.

Capt. William Bowen, Talargoch Mine.

20,898. (*Mr. Kendall.*) With regard to the men's houses, are they well accommodated in those houses or not ?—They are very good, especially some of them, I think that on an average the houses are very good here.

20,899. Do they sleep two or three in a room, or how ?—The whole family will sleep in two rooms, most of the houses have only two rooms.

20,979. (*Mr. Holland.*) Are your men as well lodged as the farm labourers in the district ?—Better ten times over.

20,980. And they are not more crowded ?—No, not so much I think, taking it in the long run.

20,981. Which get the best earnings, farm labourers or miners ?—Miners.

20,982. Very much the best ?—Yes, a great deal.

20,983. Are your men as healthy looking as the farm labourers of the district ?—Yes, and better by half than one half of them, and the miners have less difficulty of breathing at this moment, taking them in the long run and taking the farm labourers. I am quite sure that if you picked 800 men, or any number of men about the district, you would find the miners with better chests.

Dr. Thomas Hughes.

21,296. (*Mr. Holland.*) Do the miners crowd more together than the agricultural labourers; are there more in a house or is it much the same ?—Much the same, I think.

21,297. There is no material difference ?—I think not.

21,298. Are the houses much alike ?—Very much alike.

21,299. We have been told that they are very small and confined ?—They are very small all round the country here.

21,300. Like the ordinary Welsh houses ?—Yes.

21,301. Are they generally single rooms ?—Yes.

21,302. Do they take lodgers ?—Hardly ever.

21,303. Where do the unmarried miners lodge ?—Generally with their parents.

21,304. Not with strangers ?—Very seldom.

21,305. Are they generally natives of the district ?—Almost all.

21,306. You do not think that the miners, as a class, are more crowded together in their bedrooms than the agricultural labourers ?—I do not think so.

21,307. There is nothing marked in that ?—Not to any marked extent.

Mr. Richard Lewis Parry.

21,344. (*Chairman.*) Do you think that the state of the cottages is good or bad ?—Very bad indeed.

21,345. Does that tend to produce this kind of disease in your opinion ?—Yes, it does; you will find cottages with a single room, with about seven or eight or ten in family in it; they have a peculiar kind of bed here; it is more like a closet than a bed, and it separates the house into two compartments.

21,349. (*Mr. Holland.*) Are they much worse lodged than the general population ?—Yes, decidedly.

21,350. In what respect ?—As far as ventilation is concerned, and as far as regards the construction of their cottages.

21,351. Are they worse constructed cottages than the farm labourers have ?—Yes, I think they are, generally speaking.

21,352. Are they more crowded ? — Much more crowded.

21,353. How does that happen ?—I do not know how it is, but they are large in family.

21,354. Does it happen from the miners going as lodgers into other families ?—No

21,355. That is not the custom ?—That is not the custom. The cottage is just one room, and then they divide it into two by their bed.

21,356. What is a common number of inmates in a room ?—In a room, perhaps not half the size of this, you will find 10 or 15 persons living, and in others four or five or six, more or less.

21,357. Do you mean that several families live in one room ?—No; it is daughters and sons and all.

21,358. Is it common for 15 to be in one room ?—Not common; you will find them from 12 to 15, but the general average is about 7; the highest number is from 10 to 15; they are composed of daughters and sons, and you will find two or three beds in that house.

21,359. Is not that a rare case ?—No.

21,428. (*Mr. Holland.*) Can you explain why the miners' houses become much more crowded than the houses of the agricultural labourers ?—Yes, the reason is that the miner's family work in the mines, and they stick to it till they get married in one way or another. The agricultural labourer's family, when they get about 8 or 10 or 12 years of age, are distributed to different farms, and they do not live at home.

21,429. Do the miners marry earlier than the agricultural labourers ?—No, not so young.

21,430. As a habit the younger members of a miner's family remain till they are 20 or 22 years of age ?—Yes, until they get married; they are seldom married before that.

21,431. Whereas the children of the farm labourers go away at about 12 or 14 ?—Yes, as soon as they are able to handle a spade, or to feed cows, or churn, or anything of that kind, they are off directly; a farm labourer can get off his family in a moment, but a miner cannot do that.

Mr. Henry Thomas.

21,662. (*Chairman.*) Do you know anything about the cottages where the men live ?—I have been in some of them.

21,663. Of what description are they ?—They seem generally very poor indeed.

21,664. Do they generally belong to proprietors or to the men ? — The men build a great many themselves, and there are a great many also held by proprietors.

21,684. (*Mr. Kendall.*) As far as the miners go in this district, are they a healthy looking class of people ?—They are not a healthy looking class of people at all.

21,685. Can you distinguish as you go along the difference between a miner and an agriculturist ?—Not always, for the agriculturists do not look very healthy themselves.

21,686. What do you think that arises from ?—I attribute it to their imperfect cottages, they want more ventilation in their homes; most of the people in this country get a very sallow look.

21,687. Their habitations are poor ?—Most of them.

21,688. And very confined ?—And very confined; they only live in one room, or one room is divided by partitions of linen.

21,689. Have you ever gone into any of the miners' cottages?—Yes.

21,690. Do they sleep many in a room?—Yes, they do in many cases, divided in that way.

21,691. By simple sheets?—By simple sheets; by blue and check cloth, which is very common.

21,692. You can see that their mode of ventilation is very imperfect?—Extremely so.

21,693. Perhaps more so than underground?—I fully believe it; I have a strong opinion on that matter. In many of the houses the windows only consist of one small pane or two or three small panes, and without any means of opening them; they are completely built in.

21,694. Are any of the bed rooms up stairs without chimneys?—I do not know. I am afraid there are very few bed rooms up stairs; there are some little lofts and some bed rooms up stairs.

21,695. What are the floors of the cottages?—They are more often than otherwise of clay, and a sort of bog; sometimes you may sink into it if you sit down on a chair. I was in a bed room the other day of that kind where the agent of a mine was living.

21,696. Are these cottages built by the miners or let out by the proprietors?—The miners build when they can, whenever they can get a little money to do it.

21,697. Do they build on leases for lives or on long leases?—I think very often on long leases, and sometimes merely as yearly tenants at rack rent

21,698. What do these cottages cost to build in your opinion, take a cottage 16 feet long by 12 feet wide?—Perhaps 40*l*. or 50*l*.

21,699. Will they build such a cottage as that at their own cost without a deed?—Not always; they sometimes get an allowance from the landlord as well, in the shape of timber; the landlord frequently supplies the timber and stone, they paying the carriage and doing all the labour of building; that is frequently done, but it is generally under some agreement; I do not apprehend that it is very often on lease.

21,700. However, be that as it may, the cottages are very bad, and the ventilation in them is very bad?—Yes, a better class of cottages is springing up now, the new cottages which the men are building.

21,713. (*Mr Holland.*) Are the miners' cottages much like the agricultural labourers' cottages?—Very much the same, I think.

21,714. Which do you think are the best; is there any difference?—I do not think that there is much difference.

21,715. Have they generally two rooms or not?—Sometimes only one, I believe; generally two, I think.

21,716. Two, or one imperfectly divided?—Yes; I have seen that.

21,717. Have they fire-places or chimney corners with a large chimney?—Yes; that is their best means of ventilation, sometimes so much so that it is extremely cold.

Mr. Rowland Rowland.

21,892. (*Mr. Holland.*) Do you think that the cottages of the miners are materially different from those of the agricultural labourers?—No.

21,893. Are they generally very small?—They are generally very small and very dirty too, I must say; there is not sufficient care for cleanliness.

21,894. Is it common to have the window fixed in the wall so that it will not open?—It is common to have the windows without any opening, but the doors are very often very bad, and the chimney is big, so that they have a ventilation. There is only one room generally, and the door is almost always open.

21,895. Is it common for the whole family to live in what is really one room, that is to say, in one room only partially divided?—No, not very often; they generally have two or three rooms; they have a door to go into one room, and then there is a little room at the other end, and then a little loft thrown over the building for the children to sleep in.

21,896. There are three compartments?—Yes, that is the general average of the houses.

21,897. When those cottages are closed at night, does the air get very bad?—No; I have seen in towns, really in large respectable houses, the air a great deal worse.

21,898. When you have attended at night have you been annoyed by bad air?—No, not much; there is cold air coming in through crevices.

Mr. Evan Rowland.

21,948. (*Sir P. Grey Egerton.*) How are the dwellings of the poorer classes in your neighbourhood?—Very poor. I was going to suggest whether we could not get them to clean their houses better; I tell them that it is very unwholesome that they should keep their houses in the way they do. All that I can get from them is, "That is the way I have seen my father do; my father lived to old age, and I do not see why I should make any difference."

21,949. But they are habitually cleanly in their habits?—Yes, very much so on the hills here.

21,950. Are the cottages small?—Very small.

21,951. How many rooms have they, generally speaking?—About a couple.

21,952. Are they properly ventilated?—No, they are very badly ventilated, and the cesspool is close to the house, as are also dungheaps.

21,953. Do you find that the families of the miners suffer much constitutionally from these habits of dirt?—I find them in a great measure causing fever in the houses. The miner is better off than the family. During the last six years that I have been living here there has been a constant fever, typhus and typhoid, and scarlet fever, upon the hills from Goginan up to Stelvagerrig.

21,954. You attribute that in a great degree to the uncleanly habits of the people?—Yes, and the dampness of the cottages.

21,955. And their contracted dimensions?—Yes.

21,956. From your general knowledge of mankind, do you think that if they had better houses they would take a pride in them and be induced to keep them more cleanly, or do you think that it is an inveterate habit of untidiness?—As a general rule it is what they have been used to, but some are building new houses now, and they keep them clean when they get new houses. If there was a possibility of it I should like to get an inspector, or some law.

21,957. (*Chairman.*) There is a sanitary provision?—We cannot get it put into force here. I have tried all that I possibly could with the Board of Guardians.

Mr. John Graham Williams.

21,981. (*Chairman.*) Can you state anything with regard to the cottages in this district?—I know most of them.

21,982. Do you think that they are convenient and conducive to health?—I cannot say that they are.

21,983. Do the cottages generally belong to the miners or to the proprietors?—In some of the mines which are up in the mountain, there are what are called barracks erected for perhaps 100 men, they come up on Monday morning and leave on Saturday evening. Those barracks are very healthy. Then at other mines the proprietors have erected a row of cottages. Those are kept in very nice order; but it is the cottages down in the lowlands, if I may use the expression, which are in a bad state.

21,984. Do those in the lowlands belong to proprietors, or are they built by the miners?—They are mostly leaseholders.

21,985. Do the proprietors grant a long lease?—60 years.

21,986. (*Mr. Holland.*) Is the leaseholder a leaseholder of a large piece of property?—No; we grant we will say enough for a cottage and a garden.

21,987. The cottager himself is the leaseholder?—Yes. Mr. Loveden we will say is the lessee, and he grants a series of cottages and enough for a garden to each cottage.

21,988. (*Chairman.*) When they rent a cottage by the year, what rent do they pay?—It varies. Perhaps 12*s*. a year, but seldom above 20*s*. a year.

21,989. That is for the lease of the ground?—Yes.

21,990. What would be the cost of erecting one of the miners' cottages?—It would depend upon circumstances, from this cause—most of the miners' cottages are erected of mud, because we have no building stone in this country. We are very badly off for building stone, and very badly off for slates and lime. We have neither slates nor lime, nor good building stone in this part of the country at all, and therefore they are obliged to erect the cottages of mud.

21,991. (*Mr. Holland.*) Are they roofed?—They are roofed now. I do not allow any mud cottages to be erected upon the Gogerddan estate; so that in selecting

(M^{w}.)—DWELLINGS.

(M^{w}.) ings.

ground for the miners' cottages, I get them as near to the mine as I possibly can, in order that they may have stones taken up from the mines.

21,992. What is the annual value of the cottages in which they usually live?—Supposing the leaseholder was to let the cottage out to another party, it would be about 2*l*. 10*s*.

Samuel Jones, Snailbeach Mine.

22,439. (*Mr. Holland.*) Are you of opinion that the miners generally have better cottages than farm labourers?—Yes; about here.

22,440. What is the usual rent for a miner's cottage?—Some get them at 4*l*. a year, and some at 5*l*.; some are better than others, and there are more rooms in them.

22,441. Do they ever go as high as 6*l*.?—Yes.

22,442. How many rooms will such a cottage contain?—Some contain two and some perhaps three.

22,443. And a pantry?—Yes.

22,444. Do you mean two bedrooms?—Yes.

22,445. And a living room?—And a living room

22,446. And sometimes three bedrooms and a living room?—Yes, and sometimes a pantry and sometimes another place built by the side to keep milk, and to bake, and wash, and all that.

22,447. Is it customary for the miners to have gardens to their cottages?—Yes.

22,448. Is it nearly universal?—Yes, all round here.

22,449. About what size is the garden?—Sometimes five or six roods

22,450. What is your rood?—We call eight yards square a rood.

22,451. Do any women work on the mines in this part of the country?—Not upon this mine.

(N^{w}.)—CHILDREN WORKING IN MINES.

(N^{w}.) *Children Working in Mines.*

Mr. Robert Parry.

20,515. (*Mr Holland.*) Do they commonly go underground so early as 10 or 12 years old?—They go underground to watch doors, or something of that sort. Most of those boys who are employed at 12 are washing ore upon the bank.

20,516. At what age do they go underground?—Say at 16 to begin with, or 18; most of them at 18.

Capt. Matthew Wasley, Coed Mawr Pool Mine

21,101. (*Mr. Holland.*) At what age do they begin?—I do not know that we have one less than 16 or 17 years of age. The reason, generally speaking, is, that they work more single-handed; in Cornwall they work more double-handed.

Capt. B. Ridge, Rheidol Mine.

21,555. (*Sir P. Grey Egerton.*) How is your ore brought to surface, by shafts or by adit level?—By adit level.

21,556. Do you dress it on the spot?—We carry it by horses about 300 fathoms, on pails, there are two horses doing that.

21,557. They carry it to the dressing sheds?—Yes.

21,558. How many men have you employed in dressing?—We have about 20 boys and girls.

21,559. At what age do you employ the boys and girls?—We employ the boys at about 13, 15, and 16, and the woman perhaps at about 20 or 25.

Capt. James Raw, Cwm-Ystwith Mine.

21,647. (*Sir P. Grey Egerton.*) Do you employ boys and girls?—Yes.

21,648. At what age?—They go from nine years old up to, I suppose 12, on the floorings, and after 12 or 13 the boys go underground.

Capt. Thomas Ball, Lisburne Mines.

21,727. (*Chairman.*) About how many men have you working altogether in that group underground?—Somewhere about 300 miners; the number varies; it is sometimes more and sometimes less.

21,728. Are there any boys amongst them?—Yes, some.

21,729. What is the youngest age at which you allow them to go underground?—I do not know that we have any general rule for that, they go down to the little fan machines but they walk in, and the parents take down their children very young now; we have some at 10 years of age, and I think that there are some under; I am not certain as to that.

Capt. Nicholas Bray, Llwynmalees Mine.

21,826. (*Chairman.*) Have you any boys working below?—Yes.

21,827. With their fathers, or alone?—I really cannot say as to that.

21,828. What age is the youngest?—I should say that our smallest boys are from 12 to 15.

(O^{w}.)—WOMEN WORKING AT THE SURFACE

(O^{w}.) *Women Working at the Surface.*

Capt. Richard Ridge, Rheidol Mine.

21,560. (*Sir P. Grey Egerton.*) What wages do they get?—The women get about 1*s*., and the boys get about 8*d*. and 10*d*.

21,561. You have sheds for them to dress the ore under?—Yes

21,562. They are protected from the weather?—Yes, there are not better in Cardiganshire, and there is not better machinery in Cardiganshire than I have.

Capt James Raw, Cwm-Ystwith Mine.

21,650. (*Sir P. Grey Egerton.*) What wages do they get?—10*d*. a day the best of the women, and the boys in general get from 8*d*. to 1*s*., just according to their age and strength.

21,651. The women pay 3*d*. to the doctor of whatever age they may be?—Yes.

21,652. Have you sheds for them to work in?—Yes, we have very good sheds in our mine; they can work on a wet day every bit as well as on a fine day.

Capt Thomas Henwood, Snailbeach Mine.

22,381. (*Chairman.*) Have you any women working at the surface?—No.

(P^{w}.) *Education.*

(P^{w}.)—EDUCATION.

(P^{w}.) *Education.*

Mr. George Hughes.

20,388. (*Sir P. Grey Egerton.*) What schools are there of yours?—Lord Westminster has his own school at Halkin, to which all the children of the parish are invited; he pays the master and mistress, and has built the school and houses, and every accommodation, and he pays rates and tithes, and everything else connected with it.

20,389. It is entirely at his own expense?—Yes; he pays sufficient for a good master and mistress, but I believe that the clergyman charges some few pence to the children.

20,390. Is it under government inspection?—Yes; it has been placed so not long since; in fact a government inspector has always been invited to inspect it.

20,391. And you find that sufficient for the children of the district?—Yes, it is ample; there are three or four schools upon the common.

20,392. Private schools?—No, national schools.

20,393. In addition to Lord Westminster's?—Yes; and he subscribes very liberally to each.

Mr. Henry Thomas.

21,720. (*Sir P. Grey Egerton.*) What provisions are there for the education of the children; are there national schools or private schools?—There are private schools which are attached to the mines; they are paid for by a sort of subscription from the miners themselves. At Lisburne mines we retain 1*d.* per month from the miners, which is handed over to the schoolmaster, in the ordinary way; and the schoolmaster gets that, and gets paid by other people in the neighbourhood, so that he makes a small living of it; he is not one of the certificated masters.

21,721. Is any support given by the owners?—Yes; the mine subscribes something.

21,722. Messrs. Taylor subscribe in addition to the penny subscriptions of the men?—Yes.

21,723. So much a year?—So much a year.

21,724. To the salary of the master, or do they nominate a certain number of children?—To the salary of the master. We can supply all these data accurately.

(Q^{w}.) *Time Men Work.*

(Q^{w}.)—TIME MEN WORK.

(Q^{w}.) *Time Men Work.*

Mr. George Hughes.

20,341. (*Chairman.*) Does the six hours include changing at surface, or do they change down below?—I believe that the six hours embraces the whole, going down and coming up as well.

20,364. (*Mr. Kendall.*) You have spoken of small sets renewable year by year; you say that the men who work in the large mines only work for six hours, and spend also a portion of their time in working these little private concerns of their own?—Yes.

20,365. Do the adventurers and captains and agents of these large mines object to men working in both mines?—Not at all, except it is the pitman or any body of that sort, where the whole of his care should be devoted to the large mine.

20,366. But when a man only works six hours a day, they do not at all care where he works afterwards?—Not at all.

20,367. There is no suspicion that he will only work light for them and harder for himself?—They do not care if he does, because it is either by ton or yard work.

20,368. Supposing a man is on tut-work and only works four hours, do they take notice of it?—Yes.

20,369. They make him work six hours?—Yes, the agent generally goes there to see the men go down and come up.

Capt. Joseph Ninnis, Maes-y-safn Mine.

20,402. (*Chairman.*) What number of hours shift do they work?—Eight hours.

Mr. Robert Parry.

20,511. (*Mr. Holland.*) What number of hours do the man generally work?—Six, and some of them eight; there was a dispute about it. I have asked the miners when they were in health, and they say that six hours is plenty for any man.

23,512. Have you noticed that the men who work eight hours are more unhealthy than those who work six hours?—No; I cannot say as much as that, because I never took that notice. But they tell me themselves that they cannot stand the eight hours; that it is too much for them, and that six hours is as much as they can stand.

Capt. Francis Evans, Bryngwiog Mine, &c.

20,546. (*Chairman.*) How many hours shift do the men work?—They work very little in this part of the country; I should think that four or five hours is quite as much as they do.

20,547. They work six hours shifts do they not?—They call it six hours, but they relieve at surface, and by the time the parties get up and the other parties get down there is a difference of an hour or an hour and a half, I should think.

20,548. Do the men work on their own adventures; do they employ their spare hours in working small adventures?—A great may of them do, but we object to it; we pay them what we consider fair wages, and we expect to have their labour.

20,549. But you do not get so much work done as you think they might be able to do?—We consider not.

Capt. William Bowen, Talargoch Mine.

20,864. (*Chairman.*) How many hours do the men work?—Six.

20,865. Do they relieve at the surface?—Very near the surface, they meet one another about half way.

20,866. So that they do not actually work the whole six hours?—No they do not work above five.

20,871. Have they any other work, agricultural or otherwise?—We do not allow them to work in mining elsewhere, but if they like to do something on the surface for their own good they are quite welcome to do it. We do not allow them to go underground in any other place.

Capt. Matthew Wasley, Coed Mawr Pool Mine.

21,106. (*Sir P. Grey Egerton.*) How long are your shifts?—Eight hours.

Capt. William Vivian, Parys Mine.

21,151. (*Chairman.*) Do the men work eight hours shifts?—Yes; that is our general arrangement. Where we want to press them very fast we work six hours only.

Capt. George Trewren, Mona Mine.

21,442. (*Chairman.*) How many shifts of men have you working there?—Three; at Carns they are only working two.

Capt. James Raw, Cwm-Ystwith Mine.

21,595. (*Chairman.*) What shifts do they work?—Eight hours.

Capt. Thomas Ball, Lisburne Mines.

21,746. (*Chairman.*) What number of hours shift do the men work?—Eight.

Mr. James Garland, East Darren Mine.

22,163. (*Chairman.*) Do they work eight hours shifts?—Yes.

Time Work.

(Qᵂ.)—TIME MEN WORK.

(ᵂQ.) *Time Men Work.*

Capt. Thomas Henwood, Snailbeach Mine.

22,300. (*Chairman.*) How many hours shift do they work?—Eight hours.

22,325. What are their hours of work?—Six to seven hours, I think.

22,389. (*Mr. Kendall.*) Generally speaking you exact your eight hours?—Yes, we call it an eight hours shift, but the men, on the average, do not spend 6½ hours in actual work.

22,390. You work longer here than they do in other mines; when did that begin; under Captain Eddy's management?—Yes.

22,391. When you first came here?—Yes.

22,392. Did the men like it at first?—They did not like it at first.

22,393. Still you allowed them good wages?—Yes.

22,394. Was there a strike?—Yes.

22,395. How long did it last?—A fortnight.

22,396. What did they complain of?—They complained of the eight hours shift instead of six.

22,397. Did they say that it hurt their health?—Yes.

22,398. What did the doctor say?—He said that none of the men had applied to him for any medicine or drugs of any sort more than previously to the eight hours shift.

22,399. Did you go into a history of their wages at the time of the strike?—Yes.

22,400. What did you find that their average was when they struck?—The tributers would average 29*s.* 5*d.*, and the tutwork men 22*s.* 7*d.* per week.

22,401. When that was proved, had it the effect of quieting the men or not?—Yes.

22,402. What induced them to go back to their work again, your being firm or what?—It was owing to Mr. Eddy, the manager, being firm.

Capt. Richard Henry Vivian, Roman Gravels Mine.

22,513. (*Chairman.*) How many hours shift?—It is called eight hours, but it is never more than 7½ hours; we allow them to come up at half-past 1.

22,514. Do they change at the surface?—Yes.

22,515. There are eight hours clear?—Yes. When the men fire half an hour is allowed for the place to get cool a bit before the other men go in.

EVIDENCE TAKEN IN LONDON.

Tuesday, 25th March 1862.

PRESENT :

The Right Hon. Lord Kinnaird, K.T.
The Hon. Algernon Fulke Egerton, M.P.
John St. Aubyn, Esq., M.P.
Edward Headlam Greenhow, Esq., M.D.
Phillip Henry Holland, Esq.
Richard Davey, Esq., M.P.

The Right Hon. Lord KINNAIRD in the Chair.

Thomas Sopwith, Esq., F.R.S., examined.

T. Sopwith, Esq., F.R.S.

25 March 1862

1. (*Chairman.*) You are, I believe, a civil and mining engineer, and a fellow of the Royal Society?—I am.

2. Are you also a member of the Institution of Civil Engineers and of the Geological Societies of London and of France?—I am

3. How long have you been acquainted with mining districts?—Nearly 40 years.

4. Is your acquaintance confined to districts in England, or does it extend also to mining districts in France or other countries?—It extends to England, and, in some respects, to other countries also.

5. Have you ever been consulted by the Crown relative to minerals?—I have.

6. Relative to what minerals have you been consulted by the Crown?—With reference to gold, coal, and iron; chiefly those.

7. With regard to Cornwall, have you ever visited that county?—I have not, in a mining capacity. I have visited it, but not professionally.

8. Have you ever acted as Commissioner for the Crown under the Dean Forest Mining Act?—I acted as Commissioner for the Crown under the Act which is called the Dean Forest Mining Act, the 1st and 2d of Victoria, chapter 43.

9. Do you remember in what year that was?—In 1838,—from that year to 1841, when the object of the commission was accomplished.

10. I believe that you are the chief agent of the lead mines belonging to Mr. Beaumont, in Northumberland and Durham?—I am.

11. How long have you held that appointment?—Since 1845.

12. Are those lead mines extensive?—They are very extensive. I believe that they have been the most extensive lead mines in this kingdom, or I may say in the world.

13. Do you know how many workmen are employed in those mines?—The number has varied from 2,000 to 3,000, including men and boys. It is about 2,000, I should say, at the present time. I cannot speak from recollection exactly.

14. You say, men and boys. Are boys employed in these mines?—They are.

15. Are they employed in any great number?—No, comparatively few; it is rather the exception. Boys of an age under 12 years are scarcely ever in the mines, and we are not desirous that they should go into the mines until they are at least 15 or 16 years of age. They are mostly employed in what are called the washing floors; that is, in the dressing and washing of lead ore.

16. On the surface?—Yes.

17. But in the mines it is not usual to employ boys?—Certainly not as miners.

18. Under 15?—I doubt whether we have any under 15. They go as young men, in fact, to learn the business of mining, the same as boys would go to any other business. But we have not occasion in lead mines for boys who are employed as trappers, to the same extent as in coal mines. The chief use of boys which we have in the mines is in working fans, by turning a wheel. There may be some boys of rather younger age, sometimes taken from charitable considerations to give employment to them; but, as a general rule, we desire not to have them at an early age.

19. (*Mr. Davey.*) You do not limit the age?—It is not strictly limited; we are very desirous to do so, but it is found practically difficult to enforce a rule rigidly. When family matters or other matters of that kind come into consideration, we sometimes relax the rule.

20. (*Chairman.*) Are there any evening schools for those boys?—There are no evening schools at Allenheads; but occasionally they have formed what we term "Improvement Societies," where young men come to improve themselves in the evening.

21. Your experience, I suppose, is chiefly as to lead mines?—Chiefly as to those.

22. In what way do the mineral mines lie; do they lie the same as in other metal mines?—In veins or lodes, as they are called in different districts.

23. In these veins, are there distortions of the strata the same as in other metallic mines?—There are.

24. Are these called faults, or what are they termed?—I may observe that with coal, which is a stratum extending over a large tract of country, when that stratum of coal, in common with the other strata, is divided by dislocations, these interrupt the miner in his working of coal, and they are called faults and troubles, that being the aspect in which they appear to him; but it is these identical cracks or fissures which the coal miners would call faults that the lead miners work in, they are the object of his search, and the only parts from which lead is extracted.

25. So that the lead does not lie horizontally, but more perpendicularly, or inclining downwards?—Generally speaking, nearly all lead is found in veins or dislocations, which in the south-west of England are commonly called lodes: the only way in which lead occasionally lies flat, is in a formation called flats, from that circumstance; that is to say, an extension from the vein for a short distance; it rather resembles a small branch from a tree—the tree representing the principal vein. We never have lead veins lying over a great extent of country in the same way as seams or beds of coal extend over large areas.

26. (*Mr. Davey.*) Where do you find the flats, is it not generally in the limestone?—Chiefly in the limestone.

27. You do not find them in any other strata?—We do not. There are three parts of the principal bed of limestone, called the high, low, and middle flats, where the stratum appears to have been favourable for the injection of mineral matter, or for the forma-

tion of the chasm in which mineral matter is deposited, and these flats form the only condition under which lead may be described as lying horizontally.

28. (*Chairman.*) Is there any way by which you can discover these metallic veins: is there any particular rule by which you can go in searching for them?—The ordinary mode of searching for coal is by boring; that method is quite inapplicable to lead mines. The mode of searching for lead veins depends, first, upon a general knowledge of the geological structure of the district, and, secondly, upon the observation of indications of the rocks as regards their inclination on every side from the usual line in which they are deposited. Occasionally there are very marked indications of a vein at the surface, and in some few cases lead itself is seen very distinctly at the surface; these, of course, are prominent indications of a lead vein; but, as regards the great majority of lead veins and other veins of metallic minerals, they are for the most part at a considerable depth, to be obtained only by driving works of some extent; and when that is the case, they are not capable of being measured or ascertained by the process of boring, which in coal mines is a very cheap and easy mode of knowing where coal exists, and it gives an indication which is applicable to a very large extent of country.

29. Then this mode of ascertaining the position of these veins is more expensive, of course, than the boring for coal?—Much more expensive.

30. Is there any sort of calculation which you can give the Commissioners of what is the cost of this description of work to ascertain the position of veins?—It varies in almost every case. I may observe that in some instances where, as I have already mentioned, the vein is discovered at the surface, it has sometimes happened that lead has been made visible by the carrying away of a part of the bed of a river which has been laid bare, and men in crossing it have observed lead. When that is the case, if the country is of a mountainous character, they drive a level in at a comparatively small expense, and may work it, and obtain a considerable quantity of lead, without much cost. In other cases, as in the west of Ireland, I have known a very large quantity of lead to be found nearly at the surface of the earth, and an excavation of not much greater size than this room furnished a quantity of lead of the value of many thousand pounds. But these are exceptions to general mining, and in all extensive mineral mines shafts have to be sunk, or levels of considerable extent driven. I may mention that the cost of one work which Mr. Beaumont is now engaged in will probably not be less than 100,000*l.*

31. In putting the mine to work?—In what may be called the opening of the country; in exploring the country for the purpose of ascertaining whether there are veins or not, and whether they are such veins as will be profitable to work laterally from the direction of the principal drift.

32. Having once found a vein, are you pretty certain then to be able to discover the lie of other veins in that district by the first vein?—We judge first by the appearance of the surface in the way I have already intimated, and upon that judgment of course depends the position of the level or drift; which is undertaken for the working of the vein, and for the unwatering or draining of the mine.

33. In your opinion are there men more peculiarly qualified than others who have a knowledge of this peculiar position of veins?—It is an observation which has occurred to many who have had occasion to make inquiries connected with educational and other subjects, (I have heard many of them remark, and my own observation goes to confirm it,) that, generally speaking, as regards those persons who are engaged in what for shortness I call mineral mining, as distinguished from coal mines, the nature of their occupation leads them to be more thoughtful and considerate, and consequently their judgment is more matured, and more to be depended upon in questions of this nature.

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34. As respects those works which you describe, which Mr. Beaumont has undertaken, and which will cost 100,000*l.*, I suppose that in commencing them there is a plan by which you look for drainage and for ventilation?—Entirely so.

35. (*Mr. Davey.*) Do the men work by piece work, or have they a certain sum per working day?—We pay them a certain sum per fathom for driving, according to the nature of the stratum.

36. Are they paid in any manner by way of tribute?—We do not call it tribute, we call it working by bargains. It is analogous to it. Certain prices are fixed at intervals of three months, and the price fixed is paid for the lead ore after it is washed and completed, ready to be sent to the smelt mill. The local weight commonly used in the North of England is the weight of eight cwt., called a "bing." It is a peculiarity of mineral mines, that in almost every district very great confusion is apt to arise from the different terms which are used; and from the different meaning which is given to the same terms; as for example, the word "mine," is commonly applied in the Forest of Dean to mean ironstone.

37. (*Chairman.*) The stone itself?—The stone itself; the ironstone or the ore of iron. In Lancashire the word "mine" is used to express what in the North of England we call a seam or bed of coal. Then again we have the word "mine" as applied in in the ordinary sense of mining. And, as in the case of that one word, so I believe in the course of your inquiries, which will extend over the kingdom generally, you will find it almost necessary to have a glossary and parallel meanings before a clear understanding can be had of the meaning of witnesses.

38. (*Mr. St. Aubyn.*) You mean to say that if you were to examine a Lancashire witness and a Cumberland witness, the word "mine" would not convey the same idea to both of them?—Certainly not.

39. (*Chairman.*) Can you explain to the Commissioners how the lead mines with which you are principally acquainted are worked; what machinery is employed both in delivering the mine, and with regard to the men going down and up in their work?—In the simplest description of mine, scarcely any machinery at all is required, that is to say, where the mountainous character of the country admits of an adit or level being driven into the hill. From thence there is a rise, as it is called, into the vein, and some mines have been worked to a considerable extent in that manner, without the use of mining machinery at all. When works of that kind are carried to a considerable extent, it becomes necessary to have shafts made to the surface for ventilation, according to the extent of the mine. When the workings extend under level, it becomes necessary to resort either to water wheels or to water-pressure engines, or to some other kind of machinery; but in the North of England lead mines generally, steam engines are not used. It would be quite an exception to find a steam engine used in any of our ordinary north country lead mines. That chiefly arises from the great abundance of water-power; the quantity of rain falling at Allenheads, for example, being at least double that which falls in the eastern part of the kingdom, generally—in the flat lands of the eastern districts of England. When we come to a work like the Blackett Level, which is the name of the work to which I have alluded, that work is one in which I have endeavoured, with Mr. Beaumont's approval, to introduce some improvements, and the machinery which I have there used is an application of hydraulic power which is not yet very generally known. The principal feature of it is, that, instead of the water-wheel being made to apply the work direct, and so to require machinery for changing the operation from time to time, the water-wheel is made to revolve constantly in one direction, without ceasing, and it is occupied, not

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in the immediate application of power direct from itself, but for the purpose of what is called accumulating power in an apparatus called an accumulator; that is, a cylinder into which water is pressed by forcing pumps, which forcing pumps are worked by the wheel. Then the water which is forced into this cylinder of the accumulator has a piston pressing upon it, which is loaded by a very great weight,—a weight so great that the pressure which it exerts upon the water would be equal to a column of water of 1,200 or 1,400 feet in height, supposing that a natural stream or reservoir existed, and that pipes sufficiently strong to resist the pressure could be laid; but as we have no such elevations, this plan is resorted to in order to obtain that amount of pressure. Having placed the water in this position it is capable of being conveyed by pipes to distances of a few hundred yards, or it may be a quarter or half a mile, and there applied from time to time to work lathes, to work pumps, to raise the miners, to crush the ore or to do any other description of work. That application is a valuable one, and is the invention of Sir William Armstrong, whose name is so well known in connexion with his gun improvements.

40. (*Mr. Davey.*) Is that a recent invention?—I should say within the last 16 years.

41. (*Mr. Holland.*) What is the mechanical advantage of that accumulation?—The mechanical advantage is two-fold. First, it admits of the power of the water being transmitted to any works or purposes for which it is required for the time being, without in the least interrupting the water wheel which is the source of the power. As, for example, in the ordinary water-wheels used in the mines when I went to Allenheads, arrangements were to be made by which the wheel should first turn in one direction, and then in an opposite direction, when the opposite result was required. That, of course, interfered with the mechanical power in some degree. Not only is there that advantage, but also in crushing ores it sometimes happens that pieces of an extra size or hardness are met with, and we have accumulated in this apparatus a power which is equal to overcome that which the ordinary power of the wheel would not effect. I may observe that we have at Allenheads, which is a mountainous district, reservoirs at elevations of from 80 to 150 or 160 feet, from which the water is brought down in pipes, and the machinery is worked by the natural value of the column of water without any accumulation. If I were to erect that machinery again I would introduce the accumulator on account of the great facilities which it gives for accumulating power to different places and for different purposes, without any interruption of the principal source of power employed.

42. (*Chairman.*) I suppose that the power of the accumulator depends upon the weight of the column of water?—Exactly so, or upon the weight of any heavy materials employed to represent the column of water.

43. You have stated that when the level has been driven to a certain extent it is necessary to have a shaft for the purpose of ventilation?—Certainly.

44. Is there any special distance where it becomes necessary, or do the distances differ?—I should say that it varies under different circumstances. We have on the Blackett level four shafts.

45. To what length of level?—The distance between each two shafts is about a mile and a half. The length of the level altogether is nearly seven miles.

46. What is the general height of excavation of the level?—Eight feet.

47. (*Mr. Davey.*) Can you drive a mile and a half with an excavation only eight feet high?—I think so; it is a mile and a half between two shafts.

48. What means have you of carrying in the pure air?—We exhaust the impure air by a very simple process; by a water-wheel working two exhausting cylinders.

49. (*Mr. Holland.*) Like gas-holders, I suppose?—Just so, or by fans. We are engaged in experiments now, endeavouring to ascertain what are the most effective means of ventilating levels of that length.

50. (*Mr. Davey.*) This level, I presume, is driven in from a valley into the mountain?—Yes.

51. Have you sunk any shaft below that level?—No.

52. In the mine of which you speak, in what way do you obtain the ores from the back of the level; have you any communication from one rise to another?—They are poured down into waggons.

53. Can you drive a mile and a half, or three quarters of a mile, direct into a mountain without having some means which you can speak of of getting rid of the impure air?—We have not found any difficulty yet, as far as we have gone.

54. (*Chairman.*) In the mines with which you are connected, you think that, with shafts a mile and a half distant from each other, the height of the level being eight feet, you can get, by machinery or otherwise, a sufficient supply of fresh air to keep the mine in a wholesome state?—I think we shall do so.

55. But have you done it?—It is not yet completed to that extent. The level is driven, I think, somewhat more than half a mile from the entrance at present.

56. Then the seven miles of level is not in operation?—It is not in full operation; it is only a new work.

57. It is not completed?—No. Your Lordship will recollect that, in answer to the question about the cost of working mines, I mentioned that some of them were very simple and inexpensive, and that others were very costly, and I mentioned two extremes, one of the simplest and most easy kind, and one that I believe is perhaps the most costly experiment for newly opening a mine which has been undertaken in the North of England.

58. (*Mr. Holland.*) About what width is the adit?—About four feet.

59. Being eight feet high, it is about 32 feet in area?—Yes.

60. There would be no difficulty in sending a current of air for a mile and a half through 32 feet?—Not at all.

61. It is sent through very much longer proportionate lengths in coal mines?—Just so; there is no difficulty about it.

62. (*Mr. Fulke Egerton.*) Do the shafts act as up-cast or as down-cast, or as both? In coal mines there are usually two shafts, one of which is a down-cast and the other is an up-cast?—It varies according to different states. In the Nentforce level, which is a very remarkable one, the air sometimes passes up, and sometimes down.

63. (*Mr. Davey.*) Would not that depend very much upon the elevation of the other shafts?—Yes; it would vary with the temperature.

64. (*Dr. Greenhow.*) To return to the half mile of drift which you have already driven in the Blackett level, in what manner is that ventilated; have you driven a simple gallery of eight feet high and four feet broad for half a mile without any communication above?—Yes; it is ventilated by a pipe carried along, and the air is extracted by means of the two cylinders which I mentioned.

65. Placed at the entrance?—At the entrance, on the surface.

66. (*Chairman.*) And this is worked by the water power at the entrance?—Yes.

67. (*Mr. Holland.*) About what drag has the air upon it?—I cannot state exactly.

68. Two inches or so?—I can scarcely say.

69. (*Chairman.*) What sized pipe is that?—The pipe, I think, is about five inches.

70. (*Dr. Greenhow.*) In the ventilation which you have just spoken of is the foul air drawn out

through the adit by means of the exhausting cylinders, and does fresh air pass along through the five-inch pipe, to supply its place ?—No ; the fresh air passes through the drift itself.

71. And the foul air through the pipe ?—Yes.

72. (*Chairman.*) You exhaust the air by means of the pipe, and the air then passes on ?—Yes ; and the air naturally passes on.

73. (*Mr. Davey.*) What is the temperature of that level ?—Near the surface it would be very much the same as the other. The temperature varies according to the depth.

74. (*Chairman.*) Is it within your knowledge what is the exact temperature at the end of the half mile ?—No ; I cannot state the exact temperature, it varies much.

75. From your acquaintance with lead mines, are they, generally speaking, profitable to work, or does it depend upon whether they are near the surface ?—It depends altogether upon the quantity of ore, and the ease with which it can be worked. But generally speaking, with regard to lead mines, taking good and bad together, Mr. John Taylor, the Secretary of the British Association, whose opinion was from a very extensive experience (and mine quite goes to confirm it), considered that not more than 5 per cent. is made on lead mining altogether.

76. Are lead mines subject to explosion ?—No.

77. (*Dr. Greenhow.*) Is that quite certain ? Have explosions never occurred in lead mines ?—We have not had any explosions of any moment. There have been occasional explosions of very small extent, more like what persons would play with, but I have not known any serious explosions or loss of life.

78. (*Mr. St. Aubyn.*) Not to endanger life ?—No.

79. (*Mr. Davey.*) What explosions do you allude to ? Merely blasting ?—There are small beds of coal, and a portion of the gas occasionally escapes, it is capable of being lighted with a candle, and of making a small flash, but there is nothing dangerous.

80. (*Chairman.*) To what accidents are the workers in lead mines chiefly exposed ?—The accidents which have happened in the mines under my direction have been chiefly by the falling of stone, and in one instance by the giving way of timber. One case, the most serious one we have had, by which the lives of two boys were lost, was when a shaft underground took fire, and the smoke suffocated the boys, who were in a further part of the mine. During the 16 years that I have been at Allenheads there have not been more than four or five deaths by accidents in mines.

81. (*Mr. Holland.*) Out of about how many employed ?—Out of from 1,500 to 2,000, varying. The numbers were greater formerly than they are now.

82. (*Chairman.*) You say, that the shaft took fire ; what was the cause of that ?—The timber in the shaft took fire, I believe, through some of the men smoking their pipes, or throwing a candle, in all probability.

83. Do you use timber supports at all in lead mines ?—We do to a great extent.

84. Can you state generally what is the health of the miners in the mines with which you are connected ; is it generally good ?—I should say that it is generally good ; but I think that lead mining is rather detrimental, upon the whole, to the health of the men employed. We have some men upwards of 70 ; but I think that the occupation is rather injurious to health.

85. What are the diseases to which they are generally subject ?—That, I can scarcely say off hand. I gave evidence upon that point before the Committee on the Rating of Mines Bill, and I then availed myself of very exact information from the surgeon of the district. I should prefer to have it put into an exact form, rather than to speak generally upon it.

86. You will perhaps furnish the Commission with that detail ?—I will.

87. You state that working in lead mines, you think, is unwholesome to the miners. Do you suppose that it is from anything in the air, from the dust of the lead, or in what way ?—I think partially so ; but I am also of opinion that their health is damaged as much by want of prudence in above-ground management, as it is by under-ground operations ; that is to say, by their coming out of the mine very warm, and walking across the country in a very low temperature, perhaps in snow, to their houses, and then sleeping in very crowded rooms.

88. Generally speaking, do they live at long distances from the mines ?—Usually so. The general arrangement of the dwellings of the workmen in the lead mining districts is that of scattered cottages, not gathered together in large pit villages, as in the case of collieries.

89. And these cottages, you think, are not constructed on principles conducive to health ?—Yes. I think they are very well constructed. Mr. Beaumont has taken a great deal of pains, and laid out a great deal of money in improving them, and in making very comfortable and excellent cottages. But it does not signify how good they are made ; if the miners have space they will take in lodgers and crowd them, and it is extremely difficult to lay down rules for regulation in that way.

90. You state that on coming out of the mines they are very warm, and have to walk through the cold air. Is there any way in which that could be obviated ?—Yes, I think it might. I think that the establishment of baths would be a very good thing, and that they might be educated gradually so as to use them. But there is a very great prejudice against the use of anything new of that kind by the old people. At the same time, I certainly should think it of great use if they had a place to wash in, where they could have a warm bath, have their clothes dried, and have an eating house where their meat could be well cooked. I believe that a great deal of want of health arises from their food not being properly cooked, eating very dense pastry, for instance. In fact, I think that in one accident which happened, I could almost trace that as tending towards the actual cause of death. It was the case of a man who was killed in a shaft ; on my going down to look at the place, I observed that he must have travelled out of his usual road in going down to a place where he had an opportunity of sitting down, and that in going to that place, he had to all appearance tumbled over, as I supposed, from a fit of giddiness. Upon making inquiry it was found that he had been subject to fits of giddiness, that he had had an attack on the previous day, also that he had commenced to climb the shaft immediately after his dinner, which in all probability was not very digestible, and the labour in climbing the shaft and in going down again, I have no doubt, had brought on that giddiness which ended in his death ; and the coroner's inquest brought in a verdict to that effect. That was in the old mine at Allenheads.

91. Are the mines there entered by means of a shaft ?—They are entered partly by levels, and partly by shafts.

92. (*Mr. Davey.*) Are there no sheds or conveniences on the mine for the men to change their clothes ?—They change them, and put them away near the entrance on first going into the mine ; they hang them up.

93. There is no convenience for drying ?—No.

94. (*Chairman.*) Have you ever seen any conveniences where the men's clothes are dried, if they leave them over night, as is the case in some mines ?—Yes, a great deal of that is done in some of the mines in our district. In some of the mines belonging to the London Mining Company the men are at a great distance from their homes ; and in the case of lead miners who are working far from home they

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have what they call shops, in which the clothes are stowed away, they sleep there, and have convenient arrangements of that kind, which are not required in our mines, where the men are nearly all within comfortable reach of their homes.

95. But still you think that it would be desirable, that although they are within reach of their homes, not requiring to sleep away from home, yet they should have some place where they might change their clothes before they are exposed to the cold air ?—Yes, I think it would be an advantage.

96. (*Mr. St. Aubyn.*) Did you not say that they had a place where they kept their clothes near the mine, at the mouth of the level, but not to dry their clothes ?—It varies almost at every mine to a greater or less extent, but of course the shops are conveniences for putting these things in. At Allenheads mine they hang up their clothes at a sort of gallery at the entrance of the mine.

97. But they do not dry them there ?—No ; they are, in fact, not wet. They put off their outer clothing before they go into the mine.

98. (*Mr. Holland.*) They do not change their entire clothing ?—No, certainly not.

99. (*Mr. St. Aubyn.*) The clothing with which they come out of the mine is wet, is it not ?—Not very wet.

100. But it is damp ?—It is not very wet. Our mines are very dry generally.

101. (*Chairman.*) But are not the clothes wet from perspiration ?—No doubt.

102. (*Mr. St. Aubyn.*) When they come the next day, and put on the same clothes again, you mean to say that those clothes are not wet ?—They go home in the clothes in which they work, and they put them off and wash themselves as soon as they get home, and put on another suit altogether.

103. (*Chairman.*) It would, in your opinion, be advisable if a man at the mouth of the mine, on leaving his work, could change his shirt and wash and dress ?—I should be very glad to see something of that kind done.

104. Do you think that it would be of advantage to the health of the men ?—I think it would.

105. Do the men continue to work at the mines for many years, or do they leave the mines for other work ?—They usually remain ; we have cases where men have wrought for 50 years.

106. (*Mr. Fulke Egerton.*) Is the temperature of the mine usually very high ?—It varies with the depth.

107. (*Chairman.*) Are there any medical men employed by Mr. Beaumont specially to attend on the miners ?—There are.

108. (*Mr. Davey.*) What is the character of the miners generally ; are they steady ?—They are remarkably steady men, very well conducted, generally speaking ; very sedate, and free from swearing ; I scarcely ever heard an oath amongst our miners. By far the greater part of them are Methodists, either Wesleyan or Primitive Methodists, and they are very attentive to their religious worship. They occasionally have what are called revivals, which give rise to a greater animation, I think, than any other subject ; but I can give them a very high character indeed, and especially for honesty.

109. Have they any other occupation after they leave their work ?—Many of them have little farms and gardens.

110. (*Mr. Holland.*) How many hours do they generally work in the mines ?—Eight hours for five days in the week.

111. Do they generally work in corps, that is to say, a succession of men, so as to have continuous work ?—Yes, excepting at night. They go in at six in the morning, and remain till two in the afternoon, and then another party work from two till ten. They do not work at night excepting on extra occasions.

112. They never work on Sundays, I suppose ?—Never, nor Saturdays either, I may say, except in some few cases.

113. It is eight hours actually in the mine ?—Yes.

114. That does not include the time occupied in going to and from the mine ?—No.

115. (*Chairman.*) What wages do the miners receive ; is it by piece-work ?—Nearly all by piece-work, at so much per bing for the ore ready dressed and prepared to go to the smelt mill. The bing being 8 cwt. is the local weight by which they regulate all their contracts.

116. Do they work in squads for that purpose ?—They work in partnerships, as they call them; it may be two, or four, or six, or eight, and in some cases twelve.

117. (*Dr. Greenhow.*) The price of a bing of ore will vary very much, according to the nature of the strata from which it is worked ?—Very much indeed.

118. It is not a fixed price for all lead ore ?—Certainly not.

119. But it varies with the greater or less difficulty which is found in raising the ore out of the strata ?—Exactly so ; not only differing as regards the nature of the stratum, but also differing as regards the condition of the vein from time to time, that is to say, the general hardness of the stratum may be the same during three months, yet the condition of the vein as regards productiveness may vary considerably during that time, so that at the end of the quarter the men may require to have their price raised or lowered according as it is better or worse than it was when they took their contract.

120. There are four bargains in the year ?—Yes.

121. The men make a bargain to raise ore at the beginning of the quarter for a certain price, and they go on raising ore at that price for three months ; at the end of that time the price may be re-adjusted ?—Precisely so. It is not entirely piecework, because there is the element of time also introduced. It is quite obvious that if, as they once contended during a strike, they are entirely paid by piecework, it matters not how long they work But time is an element in their bargain also ; that is to say, they are to receive a certain price per bing for the ore which they raise, and they also undertake that they will work five eight-hour shifts, as it is called, during the week.

122. The ore being raised at a certain price, you keep an account for each partnership, and pay a certain sum every week to the men in advance, paying the balance at the end of the bargain ; is that not so ?—We advance them money one a month, and pay the balance at the end of each half year. Until about a year ago we had annual pays, but Mr. Beaumont has altered that, as I think, very much to the advantage both of the workmen and of all concerned, by making the general settlement half-yearly instead of yearly.

123. (*Mr. Holland.*) About what weekly wages do they make ?—They vary from about 15*s.* to 17*s.*

124. That is 40 hours a week ?—Yes.

125. (*Chairman.*) You have made allusion to a strike ; have you had frequent strikes ?—Only one in my recollection. There was one about 30 or 40 years previously to that, and I do not expect that there will be another in this generation ; perhaps a younger generation may try their hands, but I do not think that a strike would readily be repeated at the present time.

126. Was the strike for the wages or for the amount of work ?—It was entirely on account of time. They had got into a habit, when I first went there, of working from 6 to 6½ hours instead of 8 hours ; and as the time of their labour was at the very root of everything connected with so large a concern, I naturally set myself, as one of my first duties, to improve the regularity of the attendance, and to obtain for Mr. Beaumont labour

during the number of hours for which the men had contracted. I believe that the workmen generally might have been induced gradually to conform, but I consider them at that time to have been under the influence of certain leaders, 14 in number, who took an active part, and whom I discharged, not from their then current bargain, but I gave them notice to quit, or rather notice that their services would not again be required after the expiration of their bargain. Then the strike resolved itself into an effort on the part of the workmen generally to have these men back again, and, in fact, to establish if possible a right to work the number of hours that they saw fit, instead of complying with the 8 hours. There is, I consider, a great peculiarity in the character of our lead miners and of miners who are situate in remote districts, which exposes them very much to be misled by men who have motives of their own to accomplish; for, at the expiration of that strike, not one of them would give me any reason for it, they said they thought they had been bewitched, or something to that effect.

127. (*Mr. Holland.*) Did they wish to work as short a time as well as long a time as they choose?—These men desired very much to have the matter in their own guidance as it were, and not to be interfered with.

128. (*Dr. Greenhow.*) In reference to boys,—you say that boys do not work at the mines until they are 12 years of age, and that, until they are 15 or 16 years of age, they only work on the surface of the earth at washing the ore, but you also say that some young boys are employed in working fans?—Yes.

129. Will you be good enough to explain at what part of the mine those boys are employed?—Those are in the interior of the mine, where it is desirable to send air into workings which have not yet communicated with other workings, and through which consequently there is not a current of air.

130. Are these fans placed in the bad air, or in the good air of the mine?—They are in good air, and essentially so, because it is the air at the spot where the fan is placed, which is to be forced into the far end of the gallery to which they are directing it. I should mention that boys are employed in the washing floors on the surface, at even 10 years of age.

131. (*Mr. Davey.*) But the fans are placed either close to a shaft or near the entrance?—Where the air is perfectly good. We have many parts of the mine where, by the number of workings which intersect each other, the current of air is perfectly good.

132. (*Chairman.*) Without the use of fanning?—Yes, by the natural current of air in galleries.

133. Have you any means of testing the air; how do you know whether the air is good or bad?—There are means of testing it, no doubt; that is to say, accurate and scientific means of testing it. We can always tell practically when the air is bad, as it is called; but in some remote parts of the mine we cannot work constantly in them. In certain states of the atmosphere, we have to cease working on account of bad air, as it is called, and then the uncomfortable feelings of the men at once indicate that state of things.

134. You mean, I suppose, when it is a heavy, depressing atmosphere outside?—According to the weight of the mercurial column.

135. And you only ascertain that by the feelings of the men?—We can tell by the light not burning. In bad air, of course, the light goes out, or burns very badly.

136. When that is the case, are the men ordered to leave work?—They leave without being ordered; we never interfere with their leaving work when the air is bad.

137. (*Mr. Holland.*) Do they work whenever they can get their lights to burn?—Yes, if they can get their lights to burn tolerably well; but if they feel it uncomfortable they are not required to do so.

138. In some mines it appears to be the rule that if they can get light they work; is that the rule with you?—It depends upon the bargain. If they have a very good bargain they will work with an indifferent light. 25 March.

139. (*Dr. Greenhow.*) Are lead mines worked both by levels and by shafts?—Yes.

140. You have described the manner in which levels are driven into the centre of a mountain; but lead mines are also worked by perpendicular shafts from the top?—Yes.

141. How do the men descend and ascend these shafts?—At Allenheads the men descend in one of two ways; there is a shaft which comparatively few of them use, because we have a road way for their accommodation, by which they can walk into the mine by a series of inclined planes, resembling in fact a staircase, so that horses can walk freely up and down, by which means the horses employed in the mine come out every day after their labour, and go down again to it the next day. The shaft is furnished with slides, and the movement is extremely easy; you can scarcely tell that you are moving in it; and strangers going to visit the mine occasionally go down in that way; part of the workmen go down in that manner, but the greater part walk down.

142. Is the ore brought up by the shaft, or taken off by the roadway?—The ore is entirely brought up by the shaft, that is to say, a shaft worked by a water pressure engine.

143. You spoke of the roadways being 8 feet in height and 4 feet in breadth; are these the only kind of roadways which are used in your mines?—No; I was there speaking of the adit or gallery called the Blackett level.

144. What is the average size of the roadways in the other mines?—In some cases in working the veins they make them a little larger than in others; but they are a mere passage for the time being.

145. What size would that be; six feet high?—Yes.

146. By what breadth?—Between two and three feet.

147. Then, in fact, the greater proportion of the roadways in the mines are not eight feet high and four feet broad?—Certainly not.

148. But about six feet high?—Yes. In speaking of the eight feet, I spoke entirely of the Blackett level, which is a large gallery in fact.

149. Such roadways are about two feet and a half in breadth, as I understand you?—Yes, they are frequently very narrow; that is, in the workings of the vein. All the principal levels are wide enough to admit of a horse and a waggon going up; they are between four and five feet.

150. There are then in fact two sorts of roadways, one in which horse traffic is carried on, and the other through which the miners pass to their work?—Just so.

151. When a vein is reached do you continue the straight line in which your drift was previously going, or depart from it to follow the lode?—We take branch levels off; it is then divided into lengths of about 50 yards each, and rises are put up, or shafts are put down, as the case may be; and these are lengths in which the workmen, to a certain number, four or six or eight, as the partnerships may be, work; and that constitutes the form of their district for the time being.

152. In what manner do you work lead mines; is it all done with the pick, or is it done by blasting?—A great deal is done by blasting. In soft places it is done by the pick, but the greater part is done by blasting.

153. How often are the charges fired in a day?—That depends entirely upon the hardness or softness of the stratum.

154. There is no fixed period when they are fired?—There is no fixed period.

155. Does the smoke generally hang long in the atmosphere of a mine after an explosion?—That depends entirely upon the current of air at the place.

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When they are firing a new fore-head, as it is called —a gallery which is without communication with another—then it is rather slow; and as that length increases, of course the slowness may be said to increase. The men then retire from the place to a convenient distance, not only on account of safety as regards the firing of the blast, but also to wait until the smoke has gradually dispersed.

156. Do the men remain sufficiently long absent to allow the smoke entirely to disperse, or is it not the case that they frequently return to the spot long before it can be comfortable to work there?—It is a question of degree. Of course, they do not go when it is unpleasant; they wait long enough according to the condition of the atmosphere.

157. You were speaking a short time ago of candles not burning well in the ill-ventilated parts of mines; does the vitiation of the air arise from some gas given off from the strata, or from what other cause? —I presume that it arises from the oxygen of the air being consumed in respiration, and fresh air in sufficient quantity not being supplied.

158. You do not think that there is any gas given off from the strata; any black damp, for instance?—No, I think not; or very rarely. At the bottom of a shaft there is carbonic acid, but in ordinary working I should say that there is no appreciable gas.

159. In answer to a question from the Chairman, you said that lead miners were not so healthy as other people; do they often work until old age, or do they generally break down rather early in life?—We have had some very vigorous men of 70 years of age, but I should say that, generally speaking, the health of lead miners is not so good as that of an agricultural population. At the same time I think that it is very much better than in many trades. I think that in the evidence which I gave on the Rating of Mines Bill, I adduced details as to the number of deaths in Allendale, which, if my memory serves me rightly, approached very nearly to the healthiest part of the kingdom, taken by that standard. So that it would appear to go to this, that the average of life is more nearly reached in our lead mine district in the parish of Allenheads than it is in many towns; but I would much rather give you that in figures exactly. I have not had time to refer to my evidence before the Rating of Mines Committee, and to the data, and I am unwilling to trust to memory alone. I think that on the average a greater aggregate of life is obtained in our lead mining district, and that, I take it, arises from the general sobriety.

160. (*Mr. Holland.*) You speak now of persons of all ages?—Yes.

161. (*Chairman.*) From the uniform good conduct of the men?—Just so. I may mention, for example, that in seven miles, from Allenheads to the market town of Allendale town (we have a district of country called Allendale Valley, and Allendale town is called "town" to distinguish it from the valley of the same name,) there are only two public houses; there is one half way up near the church, and there is another at Allenheads; there was a third, which has been done away with. I suppose that there are very few parts of the kingdom where you can find a populous district, and only two public houses in seven miles. What is more remarkable is, that in West Allendale we have had the people petitioning for the only public house at the principal village of the district to be done away with.

162. You think that that is conducive not only to the morals but to the health of the men?—I think so; therefore my statement with regard to the health is really one which requires a little consideration. As regards the general abstract health of the district, I think it is good; but as regards the operation of lead mining, I think that it is detrimental as compared with what the individual would be if he were a farmer.

163. (*Dr. Greenhow.*) Do not the miners habitually suffer from some affection of the lungs; you hear of miners' asthma a good deal, for instance?—To some extent, but not to any considerable extent. Their hours are only 8 in the day, and that for 5 days in the week it is only 40 hours out of 168.

164. I merely wished to know whether, to your knowledge, many of the miners suffer from miners' asthma?—Some of them do, undoubtedly, but not to a considerable extent.

165. To return for a few moments to the subject of ventilation; I understood you that the mines are ventilated by shafts at the surface, and that they are ventilated also by means of exhausting the mines of foul air, and that the natural flowing-in of fresh air supplies the place of the other air drawn out by the kind of cylinder of which you have spoken. Are there any other kinds of ventilation used in your mines?—We have fans in the interior of the mines.

166. No other kind of ventilation is in use besides those three methods?—Those are the principal means employed in our mines generally.

167. The water-blast is not in use at all?—Not in any of our mines.

168. Are no means employed to secure some of these shafts serving as up-cast shafts; that is to say, have you no appliances at the bottom to secure a current of air passing up the shaft; or has the ventilation been left entirely to the unaided movement of the air in the shafts?—In the last year or two we have applied a furnace at one shaft; the furnace is at the surface, it increases the current, and improves the ventilation beneath; it is a sort of auxiliary.

169. But that is an exceptional case?—Quite an exceptional case.

170. (*Mr. Holland.*) I suppose you adopt this plan of driving the air out by the apparatus which you have described, because it is cheaper than a furnace? —We could not apply a furnace very well at the adit level.

171. But if you could apply a furnace, would it not be a great economy to apply coal rather than mechanical power?—We have water in great abundance.

172. (*Mr. Davey.*) Are the children of the miners generally healthy, up to a certain age?—Very healthy; and great facilities are afforded for their education.

173. Then they are in a very good condition when they become of age, to go beneath the surface and work?—Yes; I should think that they arrive at a greater average age than is usual in towns.

174. (*Chairman.*) What is the description of food on which the miners live?—They have meat, which is frequently put into pies of paste, of a more dense consistency than I should like. I have often been sorry to see young children in the school eating pie that, I am afraid, any of us would require a very good appetite indeed to be able to manage.

175. But still they have meat?—Yes, meat and fruit pies; they sometimes have fruit pies and sometimes meat; they are very well fed.

176. Do they have bread?—Beautiful bread.

177. Do they bake it themselves?—Yes; and they have an abundance of cakes, and various ways of cooking bread which is quite remarkable.

178. What is their drink chiefly?—I should say for the greater part water; a great number of them are teetotallers. Some of them, of course, drink beer occasionally, but not to any great extent.

179. Do they drink tea to any extent?—Yes.

180. And coffee?—Yes; you can get a very comfortable cup of tea indeed in a miner's cottage. I have sometimes, when I have been engaged in extensive mineral surveys, been extremely glad to go in and have a cup of good tea and what they call knead cake, a flat cake baked on the girdle, and buttered and cut up in small squares. That I have enjoyed in a miner's cottage, and have thought it as great a luxury as one could have in any place.

181. I suppose you are speaking merely of the mines of which you have the superintendence, Mr. Beaumont's mines?—I am speaking generally of lead mines in the north of England; taking Alston

Moor, Teesdale, Weardale, and that general range of mining district. Taking an area of 400 square miles or more, round about the central part of the north of England, it constitutes the lead mining district; and the evidence which I have given, so far as it is of a general character, may be considered as applying to that district.

182. Both as to time and wages and food ?—Just so.

183. (*Mr. Holland.*) I think you said that the air in the mines had not been analyzed ?—I cannot say that it has not been analyzed, but I have not in my recollection data respecting it.

184. (*Dr. Greenhow.*) In speaking of the strata through which the roadways are driven, you spoke of limestone. Are the lead mines driven through other strata besides limestone strata ?—Occasionally. The series of strata in the lead mining districts is of the carboniferous limestone formation, so called, but the limestone in that district is very much divided into thin bands as compared with what it is in Derbyshire, and still more so as compared with what it is in the South-west of England, near Bristol; so that the very thickest bed of limestone that we have is not more than about 60 feet in thickness. Nearly all the other beds of limestone are of comparatively small extent, except one or two, about 15 feet or 20 feet. Then, if you consider that there are about 20 of these beds of limestone divided in a vertical depth of between 2,000 and 3,000 feet, all the remaining depth is made up either of bands of sandstone, or of what is called plate or shale, or argillaceous schist; there are alternations of these three; the plate is merely indurated clay, and there are the sandstone strata and limestone.

185. Do you meet with what are called shakes or cavities in the strata ?—Occasionally; particularly in the limestone.

186. Do they facilitate the ventilation of the mines?—In some few cases they do. I have known some of these shakes or cavities in the limestone extend a distance of several miles, as ascertained by passing materials through them, such as chaff, putting them in at one end and watching them out at the other. I have travelled in a natural cavity of this kind for a distance of a quarter of a mile. But these cavities rarely occur so as to be beneficial to practical mining operations.

187. (*Mr. Holland.*) I have been told that accidents in blasting are much less frequent in the lead mines of the North than in the copper mines of Cornwall ?—They are extremely rare in our mines.

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188. That has been attributed to using soft material between the tapping and the powder ?—I think that arises from the fact of the people having been accustomed from one generation to another to be miners, and they get an aptitude.

189. So they do in Cornwall. Do you use hay and paper and soft materials between the tapping and the powder ?—Yes.

190. You think that prudent, do you not ?—We do not interfere much in a matter in which the safety of the miners is so much concerned.

191. What fuses do you use ?—Powder put into paper.

192. Made at the time ?—Yes.

193. Does it frequently hang fire ?—No, they are generally very effective.

194. It is with meal powder, I suppose ?—Yes.

195. You have seldom occasion to pick out the charge, I suppose ?—Very rarely indeed.

196. Are copper rods used for loading, or do you use any iron picks in loading the shot holes ?—Iron mostly.

197. Does it ever strike fire ?—Very rarely; we have scarcely ever found any accidents in blasting.

198. In limestone rock, I suppose, you hardly find any accidents in blasting ?—No.

199. (*Dr. Greenhow.*) Do you drive parallel galleries, that is to say, when you have driven an adit from the bottom of a hill, do you by and by drive another gallery over that ?—Yes, occasionally.

200. And sometimes on the one and sometimes on the other side of it ?—Yes.

201. When you have driven two or more of these parallel galleries, do you communicate between one gallery and the other ?—Yes, necessarily so, because before you make the one above, the lower one is considerably under ground, and a continuation is made by a rise from the first drift. For instance, if there was an entirely virgin vein to be worked, the first operation would be to drive a level along by the side of the vein at a little distance, and then to make small cross cuts, as they are called, to the vein, and rises in the vein at distances of about 50 yards.

202. So that, in fact, the mine consists of a number of parallel roadways, which communicate one with the other ?—If a vein is of great extent, high and low levels are driven, and these of course are nearly parallel.

203. And they communicate one with the other ?—They do.

The witness withdrew.

Adjourned to Thursday next, at 2 o'clock.

Thursday, 27th March 1862.

PRESENT :

The Right Honble. LORD KINNAIRD, K.T.
The Honble. ALGERNON FULKE EGERTON, M.P.
NICHOLAS KENDALL, Esq., M.P.
HENRY AUSTIN BRUCE, Esq., M.P.
JOHN ST. AUBYN, Esq., M.P.
EDWARD HEADLAM GREENHOW, Esq., M.D.
PHILLIP HENRY HOLLAND, Esq.
RICHARD DAVEY, Esq., M.P.

The Right Honble. Lord KINNAIRD, K. T., in the chair.

ROBERT HUNT, Esq., F.R.S., examined.

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203. (*Chairman.*) I believe that you are a Fellow of the Royal Society, and Keeper of the Mining Records ?—I am.

204. Are you intimately acquainted with most of the mining districts in Great Britain ?—With nearly the whole of them.

205. With Cornwall in particular ?—More especially—more intimately than with any other, certainly.

206. You have furnished, I believe, statistical returns of most of the British mines ?—For the last eight years I have been in the habit of doing so annually.

207. You have, I believe, a number of plans; are those taken from working plans of mines at present in operation?—From mines which are abandoned, and also from mines which are now in active operation in all parts of the United Kingdom.

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208. Have you plans of most of the mines in Cornwall ?—In Cornwall nearly all ; in the other parts of the country the collection is not yet complete.

209. Are these plans mostly of recent date ?—There is a considerable collection of the plans of the abandoned mines. The other plans are made up to the most recent date to which they can possibly be made up, with the means at my command for doing so.

210. (*Mr. Kendall.*) What means have you at your command of getting at plans ?—A grant from the Government of 100*l.* a year.

211. Do you find a difficulty amongst the mines generally in getting at their plans ?—I have scarcely ever any difficulty ; they are usually furnished to me with very great willingness on the part of the miners. Of course my office is at the expense, or at the trouble, of copying them or having them copied.

212. Will you mention two or three of the deepest mines in the West which you know ?—The Consolidated, the United, the Great Wheal Vor, and the Fowey Consols.

213. Up to what date have you plans of those mines ?—I believe that the plans of all which I have named, except of the Consolidated Mines, are up to within the last two years certainly ; some of them up to the end of last year. I may state that my practice with regard to those is, that I generally spend a month or two in the year in Cornwall. I take with me tracings of the plans which I have in my office in London, and fill them in from the working plans of the mines.

214. (*Mr. Davey.*) Have you found plans in most of the mines which you have visited ?—Within late years the plans of the mines have not been so well kept up as they were 10 years since.

215. Do you not find that many of them have been neglected for a very considerable time ?—Very many. I might mention one large mine—the Consolidated Mines—in which, I believe, they have not kept up their plans for the last nine years.

216. They are not working in the bottoms ?—No.

217. The mine has been virtually suspended, has it not ?—Not for the whole of that period.

218. Have the plans of the adjoining mines, the United Mines and the Wheal Clifford, been well kept up ?—Yes.

219. (*Chairman.*) You have every reason to believe that these copies which you have, are correct ?—They are fairly correct. In some cases I find the surveyors themselves at fault, but beyond that error, which is only an unimportant one, in most cases they are correct.

220. Have you verified, by means of any of the officers under your command, the plans of any of these mines ?—Yes, a great many of them ; and I have myself assisted in the surveying for the purpose of the verification of some of them.

221. Could you furnish, if we require them, tracings of any of these mines. At what expense could they be furnished ?—As far as my office, being a Government establishment, is concerned, I should think that the Commission could command any of the plans which would be desired. I have but two assistants at my disposal, therefore, with the other duties there is the difficulty of fully occupied time.

222. (*Mr. Austin Bruce.*) These plans show the workings, I suppose ?—Yes ; I have some of them here.

223. Do they also show the extent of the areas ?—To a certain degree they do ; they are all drawn to scale.

224. (*Mr. St. Aubyn.*) Are they all on the same scale ?—They are not. This is a section of the United Mines, which is on a scale of 22 fathoms to the inch, and it is a very fair example of plan drawing.

(*The witness explained the same to the Commissioners.*)

225. (*Mr. Kendall.*) I believe that the miners are more exposed to heat in the United Mines than in any mine in the county of Cornwall ?—Most decidedly so. I have been myself in the hot lode of the United Mines, and measured the temperature in the level at 110°. The actual temperature of the rock was measured by a thermometer being enclosed in a borehole for some three or four hours, and it varied from 112° to 114° at different trials.

226. How long could a miner work there ?—I found, upon making special inquiry there, that the average time of working was 20 minutes, and that he was then obliged to retreat. Upon the retreat of the miners they went some distance along the level, and washed themselves in water for the sake of cooling themselves, the temperature of which was about 90°.

227. (*Mr. Holland.*) What interval is there between the times of the men working ?—A period of perhaps about an hour ; they were thoroughly exhausted, and I have seen the men even in that time continually washing themselves in cold water, which had been taken in for the purpose.

228. So that they work 40 minutes out of 100 minutes ; there is a certain interval and then 20 minutes of work ?—Exactly ; but that would not be kept up, they would not return to their working more than four times in the 8 hours.

229. They would work four times 20 minutes in 8 hours ?—Yes.

230. (*M. Davey.*) In what part of the mine was that ?—In the hot level. The information with regard to that subject was given to me on the especial occasion of Mr. Mackworth's being at the Polytechnic, and wishing to introduce some mode of ventilation into that particular level ; and he was led to believe that the experiment he recommended had been tried there, which was not the case.

231. (*Mr. Austin Bruce.*) That is an extreme case, I suppose ?—Yes.

232. (*Chairman.*) Do you know, from your large experience, what has ever been paid to the miners for driving the level to a certain extent in a cross cut in that mine ?—I understand that three guineas an inch has been paid.

233. (*Mr. Kendall.*) What was the object of driving there at that time, was not it for ventilation ?—The object was to make a communication with the adjoining mines by which the ventilation would be greatly improved, and of course it was hoped that the temperature would be reduced.

234. Was that the case when the communication was mode ?—The temperature has been somewhat reduced. I am not exactly aware of the extent, but not to the full extent which was I believe expected.

235. (*Dr. Greenhow.*) Is 114° the highest temperature of that mine ?—It is the highest temperature that I measured there myself, but I have understood that the temperature has been as high as 117°.

236. (*Mr. Davey.*) Have you found any inconvenience result from the peculiar sensation ?—I cannot say that I have.

237. You could stay there ;—Yes, without much inconvenience, but feeling a good deal of exhaustion afterwards.

238. (*Mr. Austin Bruce.*) What did you say was the depth ?—230 fathoms from the adit ; 270 fathoms from the surface.

239. (*Mr. Kendall.*) Was it essential to the working of the mine that that communication should be made ?—I think so, decidely.

240. Do you know of any additional means available at present of ventilating it more than were adopted ?—There are no doubt enormous difficulties in connection with any mode of ventilation in the hot levels of the United Mines.

241. What experiments were tried ?—I am not myself aware of any of the small experiments which were tried, being in any way successful.

242. There was an activity shown at the time ?—Yes.

243. (*Mr. Davey.*) Are you aware that they tried an experiment at Wheal Clifford, by sinking winzes within a certain distance of the shaft, and that as

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they descended from one level to another, so they purified the air, and it became cooler ?—I do not know it from my own knowledge. I have not been under ground at Wheal Clifford, but I have heard of the experiment there.

244. And that it had a wonderful effect ?—So I have heard.

245. (*Chairman.*) Can you inform the Commissioners as to the mode which is adopted in the mines in Cornwall for ventilation ?—In sinking a shaft, to begin with, the usual plan is to use a wind sail or funnel to send air to the bottom of the shaft. Having commenced driving their level, they, as soon as possible, sink a second shaft, by which they get natural ventilation, the air passing down the one and up through the other, and the practice is to continue that system by a series of shafts, or a series of winzes, connecting one level with the other, so as to secure that natural system of ventilation throughout the mine, and, speaking generally, throughout all the principal parts of the mines in Cornwall that ventilation is certainly sufficient.

246. (*Mr. Austin Bruce.*) Without any artificial aid ?—Without any artificial aid.

247. Without any furnace at the bottom of the upcast ?—A furnace is never thought of; such a thing is unknown. There are no artificial means under those particular conditions.

248. (*Chairman.*) Is there any specified distance, either according to depth or otherwise, at which these winzes should be one from the other ?—The levels ordinarily being at a distance of 10 fathoms one from the other, the communications are made by means of winzes from one to the other, at distances varying from 40 to 50, 60, or 70 fathoms, as the case may be.

249. (*Mr. Holland.*) They are seldom less or more than the extremes of those distances, are they ?—Very rarely indeed.

250. (*Mr. Austin Bruce.*) Do you mean that a sufficient current of air can be got to permeate extensive workings by means of natural ventilation alone ?—I might mention, in answer to that question, that at the bottom of the deepest mine in Cornwall, namely, Tresavean, the air was as good as the air in this room, entirely by the system of natural ventilation; it was 310 fathoms below the adit and 348 fathoms from the surface.

251. (*Mr. Davey.*) Is it not very frequently the case that there are pipes carried in ?—There was no artificial means carried in there.

252. (*Chairman.*) The air in that case you say was as good as above. Did you test it, or by what means did you ascertain that that was so ?—I speak there merely as the result of my own feelings; there was no discomfort whatever; there was a good current of air.

253. (*Mr. Kendall.*) Did you see the candle affected by the draft ?—Yes, most decidedly.

254. (*Mr. Holland.*) And the candle was burning well ?—It burnt beautifully. There was rather too much air, occasioning the candle to gutter from the flame blowing about.

255. (*Mr. Austin Bruce.*) How is the necessary current of air produced; how do you account for the supply being sufficient ?—There are two or three causes in operation. In the first instance, if you merely sink two shafts down to a horizontal level, you will find that there will be in the course of a very short time a circulation of air established. As an illustration of that, if we place a glass tube over a candle, we shall find that in the course of a short time that candle will go out. Supposing we had a glass tube a yard long, if we took a piece of cardboard and passed it down, say two thirds the length of that tube, we should then establish a current down on the one side and up on the other side, and we should have air quite sufficient to support the combustion of the candle as perfectly as would be the case out of the tube. In that way we have, on a large scale, the same effect in the mines by means of high shafts and winzes communicating from level to level, and eventually with the surface.

256. (*Mr. Kendall.*) Did you ever know a case in Cornwall where two shafts were connected, at whatever distance, without at once having good ventilation ?—I do not know a single instance.

257. (*Mr. Austin Bruce.*) Will you state why these means, which are sufficient to ventilate copper mines, are utterly insufficient to ventilate coal mines ?—The conditions of working are entirely different in the two cases. A copper lode may be regarded as on a vertical plane, upon or near which the shaft is sunk, and there is level after level, formed at increasing in depths. On the contrary, in a coal mine we sink one shaft down to a horizontal plane, then the ways are driven upon it; and whether we adopt the pillar and stall mode of working, or the long-wall mode of working, in a colliery, we have to get a current of air to pass along this horizontal plane through all the intricacies of those various ways, and in the greater number of cases to return to nearly the point from which we started, and to ascend through the up-cast shaft. Consequently, by such a mode of working, it is absolutely necessary that some artificial means should be devised to increase the rapidity with which the current is drawn out of, or driven into the mine.

258. Then the main difficulty in a coal mine arises from the great extent of horizontal working ?—Yes.

259. (*Mr. Holland.*) Does not a coal mine require very much more air in proportion to its size than a copper mine ?—I think not. If you come to the question of the existence of firedamp, then of course it does; but it does not require more air for ventilation.

260. Is not the number of men working in a coal mine much larger in proportion to the area of the mine than in a copper mine ?—Yes.

261. Is not the quantity of air which a man requires in a coal mine three or four times as great as in a copper mine ?—It would be greater certainly.

262. (*Chairman.*) Is the ventilation of the shafts affected by the state of the atmosphere above ?—Very slightly.

263. (*Mr. Davey.*) If you have a close day, do you not find a difference in the ventilation below ?—I do not fancy that that would make a greater difference than you would experience on the surface.

264. Have you not known instances where men have been obliged to come up from under ground because they have not been able to work ?—Certainly.

265. In consequence of the weather ?—The effect of close and muggy days has been frequently referred to, but I do not fancy that the ventilation of the mine that is to say, the current passing through the mine, is much influenced by such a condition of the atmosphere; at the same time, I must admit that that character of atmosphere materially influences the condition of a delicate man.

266. (*Mr. Austin Bruce.*) Surely the rapidity with which the air passes through the mine is a good deal determined by the temperature outside, and the temperature at the bottom of the pit, is it not ?—To a considerable extent. Of course you have the advantages of the increase of temperature with the increase of depth, which is in a constant ratio.

267. (*Chairman.*) The temperature at the lower part of a mine does not increase according to the state of the temperature above the mine, does it ?—It does not.

268. That is constant; but though the ventilation may be as good, is not the state of the heat below somewhat affected by the condition of the atmosphere above ?—Whatever may be the temperature of the atmosphere on the surface of the earth, when we get to a depth of about 25 fathoms from the surface, we have throughout the year a constant and unvarying temperature. For every 50 feet in depth, for the first hundred fathoms, we have an increase of 1° of Fahrenheit in the temperature of the air.

269. (*Mr. Austin Bruce.*) Is that constant ?—That appears to be constant.

270. Is it the same whatever the stratification may be ?—Yes, relatively to the temperature of that stratification ; the temperature differs between granite and slate occasionally, at the same depths, two degrees.

271. In which is the heat the greatest ?—The slate is always warmer than the granite.

272. (*Mr. Kendall.*) Is it not true that in some localities, and in different strata, you can drive much further without ventilation than you can in others ?—It has been so stated to me by miners, but I never could understand the reason why.

273. (*Mr. Davey.*) In what you call a muggy day, will not the gunpowder smoke lie much longer in the levels than otherwise ?—I cannot speak from my own experience upon that point, never having noticed it. I have heard the miners complain of the influence of the atmosphere in the mine below most certainly.

274. (*Mr. Austin Bruce.*) You would not question the fact that the ventilation would be much brisker on a cold, bright day than on a muggy day ?—I think that if you will allow me to go on with my explanation, I can remove that difficulty from your mind. The increase of temperature is one degree in every 50 feet for the first hundred fathoms ; it is then one degree in every 75 feet for the second 100 fathoms ; and it is then one degree for every 85 feet, or thereabouts, in the third hundred fathoms. Consequently, in our deep mines we get a temperature always considerably higher than the temperature of the surface, and hence you have not, as I can understand it, such variations below, dependent upon the atmosphere above, as you have in the coal mines, the conditions being so different in that respect. Of course we have all the advantages of this increase in temperature of the air to assist us in ventilating the Cornish mines in the same way as a furnace assists us in ventilating a coal mine.

275. (*Mr. Holland.*) Although the extreme depth of a copper mine may be 300 fathoms, is not the average depth of the excavations much less than that ?—Of course ; very much less.

276. The temperature of the air in a mine will be according to the average depth rather than according to the extreme depth ?—Undoubtedly.

277. Therefore the difference between the temperature of the average depth and the temperature of the external air may be slight ?—Down to the depth of 30 or 40 fathoms you will find that the external atmosphere will exert a considerable influence upon the levels of the mine ; below that depth you will find the influence continually diminishing.

278. (*Mr. Austin Bruce.*) I suppose that, as in coal mines, you have a column of descending and a column of ascending air ?—Yes.

279. With their various ramifications ?—Yes.

280. And they are kept apart ?—They naturally keep apart ; they naturally arrange themselves into an ascending and a descending current.

281. (*Chairman.*) But there are no artificial means, as in coal mines, to divide the current ?—There are no artificial means in the main portions of the workings. Artificial means are employed when they are driving levels, not having yet established any openings or winzes from one level to the other.

282. (*Mr. Holland.*) They are for local ventilation ?—Yes.

283. But there are no artificial means for general ventilation ?—No ; no artificial means apparently being required.

284. (*Mr. Austin Bruce.*) Is the ventilation equally good in all the Cornish mines ?—Certainly not.

285. In what arrangements does the distinction consist between a well ventilated and an ill ventilated mine ?—You will find the ventilation good in a mine in which the shafts are well constructed, that is to say, without any very extraordinary twists, where the levels have been fairly worked, of a mean average height and width, and where they have not been worked, (as is the case in some careless mines,) with merely a hole which a man can crawl through. In other mines, where the miners have been careless about their workings, where the shafts are irregularly sunk, where the levels have been carelessly driven, where piles of rubbish have been allowed to accumulate, and so on, you will find the ventilation much interfered with. Those are the main differences between a well and a badly-ventilated mine.

286. Then the ventilation of a Cornish mine is infinitely easier than the ventilation of an ordinary coal mine ?—Yes.

287. It only requires ordinary care in sinking the shaft and in driving the levels, and keeping a certain area of way open ?—That appears to be all which is necessary, except when they are driving their levels, not having yet established their communications.

288. (*Chairman.*) You say that the height and width of these levels differ ; what, in your opinion, ought to be the height and width in a well ventilated mine, both for ventilation and for working ?—You will find some levels in the well-ventilated mines having a height of 7 and 8 feet and being 3, 4, and 5 feet in width.

289. (*Mr. St. Aubyn.*) Does not it vary according to the lodes ?—Yes ; I am speaking generally ; where the lodes are wider, of course you will find that the levels are worked much wider ; where they are very narrow there is a great tendency to contract the levels.

290. So that in those cases, where you say that the hole is only enough for a man to crawl through, it may be from the narrowness and the poverty of the lodes ?—No doubt ; but I believe that it is an injudicious practice as regards the economy of working, and certainly injudicious as regards the men themselves, even where the lodes are small.

291. (*Mr. Austin Bruce.*) There is no necessity for limiting the size of the way to the thickness of the lode ?—There is no actual necessity ; it is only the cost of removing the rock on either side.

292. (*Mr. Kendall.*) In Cornwall, does not it very frequently occur that when you are driving to a very great depth, it would cost a very large sum of money to have a main shaft down, and that they hesitate to do it ?—Certainly.

293. Then you have no ventilation ?—There are very few cases in which they have not communications made by winzes.

294. You have partial ventilation ?—Yes ; and of course you would then get the workings of the mine somewhat in the condition of the ordinary close ends where the air is stagnant, and there is a deficiency of oxygen, and so forth.

295. Will you explain what is done in that case to create a certain sort of ventilation ?—A very common plan is to carry in a pipe of some kind or other, either of wood or, as I have sometimes seen, of canvass, from the nearest place where good air is found into the end of the level. Then another method, where that is insufficient, will be some pneumatic arrangement, either a fan or a plan with which many of you gentlemen will be familiar, similar to that which is adopted in Struve's ventilator in coal mines, namely, water buckets going up and down in a barrel of water, which is a very old fashioned mode of passing in currents of air.

296. (*Mr. Holland.*) A duck engine ?—Just so.

297. (*Chairman.*) These contrivances are adopted in mines where you say there are not a proper number of shafts or winzes ?—In mines where the shafts are insufficient to create the necessary current of air.

298. (*Mr. Holland.*) I think you said that this was only local ventilation to carry air from a better to a worse part of a mine ?—Yes.

299. Not external air, but bad air to make worse air better ?—I would not say that they were taking bad air, because my experience is, that in most of the mines you will find in some part or other, not very far from the workings, air which is fairly good.

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300. (*Mr. Davey.*) But you use some artificial means as well to supply those pipes with air, do you not?—Yes; in some cases the fanning machine, and in others a duck engine. In some mines they have a method similar to the Catalan forge arrangement, and various other contrivances.

301. (*Mr. Austin Bruce.*) Are the pits ever bratticed?—Bratticing is a thing which is nearly unknown in Cornwall.

302. Then, I suppose, you always have two pits?—Almost always, except in a very young mine.

303. (*Mr. Davey.*) In a young mine you make a division in the shaft, do you not?—Yes, either by a tube or some subordinate arrangement.

304. (*Mr. Austin Bruce.*) Are there any other disturbing causes to ventilation, besides what you have mentioned, namely, the insufficiency of the air ways; are there gases?—There are no gases of any moment occurring in any of the Cornish mines; the accumulation of carbonic acid is rather due to the formation of it in the processes of respiration by the men than to any carbonic acid accumulating from the rock. I know some few places where certainly carbonic acid is given out from the rock, but those are rare.

305. (*Mr. Holland.*) What is the largest percentage of carbonic acid which you have noticed?—I do not remember having found, at any time, more than three per cent. of carbonic acid above the ordinary per-centage of the atmosphere. I mean three per cent. of the whole air which has been operated upon.

306. Have you ever found as much as that?—Yes, I have found as much as three per cent. in some of the extremely close ends, in which there is the greatest difficulty in burning candles.

307. Is it not extremely rare to have so large a per-centage?—Yes, I am now speaking of extremely rare cases.

308. What has been the usual per-centage in poor air?—Not one per cent.; but the bad air in the Cornish mines has not so much an excess of carbonic acid as a deficiency of oxygen.

309. (*Mr. Austin Bruce.*) I suppose we may take it for granted that such a thing as an explosion is utterly unknown in a Cornish pit?—Quite unknown.

310. (*Dr. Greenhow.*) What causes the deficiency of oxygen?—It is caused by the candles, and the ordinary processes of respiration, taking oxygen from the air, the carbonic acid which is formed being very rapidly absorbed by the water in all the damp parts of the level.

311. Have you made any estimate of the deficiency of oxygen in the different Cornish mines?—I copied last night from a publication of my own in the reports of the Polytechnic Society of Cornwall, some analyses which I made many years since of the air, taken from the deep levels of the Consolidated Mines. The volume of oxygen in 100 parts of common air is about 21; that is to say, 20·821. The air taken from 245 fathom level, that is to say, 290 fathoms from the surface, 14 fathoms from the engine shaft, and 20 fathoms from any shaft, contained only 16·25 of oxygen, instead of nearly 21. Another sample taken from 250 fathoms level, 20 fathoms from a shaft, gave me 17 of oxygen.*

312. (*Mr. Kendall.*) That was where there was no connection?—Yes. At 40 fathoms from a shaft I had another sample, and that gave 17·50. In air taken from the 230-fathoms level at Wheal Fortune, 50 fathoms east of a shaft and 20 fathoms from a winze, the oxygen was 19·15.

313. (*Dr. Greenhow.*) That is in another mine?—One of the same series of mines.

314. (*Mr. Holland.*) How much carbonic acid was there in those cases?—The carbonic acid in the first instance was 0·75, in the second 0·54, in the third 0·7. Then, in Wheal Fortune, where the oxygen was 9·15 the carbonic acid was 0·10. In air taken from the 210 fathoms level, about 100 fathoms from any shaft, except by winzes about 20 fathoms behind the end, the oxygen was 18 and the carbonic acid 0·27. In air from the 230 fathoms level, also in Wheal Fortune, 70 fathoms from any shaft, the oxygen was 17·75, and the carbonic acid 0·25.

315. In all these cases the deficiency of oxygen was very largely in excess of the excess of carbonic acid?—Yes.

316. (*Mr. Austin Bruce.*) What effect upon the health of a workman would be produced in the first level which you mentioned as having 16 of oxygen?—Destruction of the vital powers. I speak now not as a medical man.

317. Were men working there?—Occasionally; but the air was put in circulation, and consequently improved, by some artificial means.

318. Was it clear that they were working under adverse conditions?—They were working under great difficulty,—labouring severely. There was considerable action of the lungs and heart induced by the difficulty under which they were working.

319. To what was the deficiency of oxygen owing in that case?—The deficiency of oxygen I take it was entirely due to the stagnant state of the air, the oxygen having been absorbed by the burning candles and by the men in the processes of vitality. My own experience of similar ends,—and also in that particular end,—was the extreme difficulty of getting to the surface after I had been in such ends for less than half an hour.

320. (*Dr. Greenhow.*) You had not felt affected by the condition of the air while in it?—I cannot say that I suffered much when in the level, but when I subsequently underwent the toil of climbing, then the breathing became very laborious indeed, and it was only by a strong effort of the will in such cases that I could retain my hold upon the ladder so as to climb to the surface. In one particular instance in East Pool Mine I remember that for a week afterwards the debilitating influences were great.

321. (*Mr. Holland.*) This was the effect of bad air, not of fatigue?—Just so.

322. You have not felt the same when the air has been good?—No.

323. You have had the advantage of a medical education?—Yes.

324. (*Mr. Kendall.*) Did you ever make any experiment upon the air immediately before or immediately after a communication?—No, I think not; in all the experiments which I have made upon the air, the air has been taken from reputed bad ends.

325. (*Mr. Austin Bruce.*) Have you any reason to think that in this particular case of which we have been speaking, that was the ordinary state of the ventilation, or was it exceptional?—It was the ordinary state of the ventilation in each particular end, and would remain so until communication was made, or some means of ventilation were adopted.

326. Were they at that time in a state of transition; were they making their communications so as to secure improved ventilation?—Having driven a little further on in those particular cases they would make a communication by means of a winze.

327. (*Dr. Greenhow.*) Were no means in operation to carry fresh air into those ends?—In those particular cases there were not any such means, and it too frequently happens that the means which might be used are neglected.

328. (*Chairman.*) That would be the ordinary state of the atmosphere in most ends unless there were any artificial means of conveying ventilation to them?—It would be the ordinary state of the atmosphere, certainly.

329. (*Mr. Holland.*) Those were the ends in which the men were habitually working?—Yes.

330. (*Mr. Davey.*) How long ago is that?—Those particular analyses were made above 20 years since (1841).

331. (*Mr. Austin Bruce.*) Are cases such as that which you have mentioned where the quantity of oxygen was only 16 per cent., due to exceptional circumstances arising from the progress of the works, or are they ordinary?—I believe that they exist

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* These samples of air were taken from notoriously bad ends.

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in all our mines, driving levels, not having yet completed communications with levels above or below. Those conditions are constantly occurring, and in such conditions (we will suppose this room be enclosed to represent one of the conditions) we can very well understand that the number of the men working would rob the space of its oxygen, and that the air being stagnant, there being no fresh supply, in the course of a short time we should find carbonic acid in excess and oxygen deficient. We do not find so large an excess of carbonic acid in those levels as we ought to find, because the levels are dripping with water, and the carbonic acid is absorbed by the water as rapidly as it is formed. But those conditions are constantly occurring in all our mines, and those are the particular points requiring special attention.

332. Is there any cause for those adverse conditions, except economy ?—No, I think not.

333. Would there have been, in the case which you have mentioned, any material difficulty in bringing a proper supply of healthful air to the mine ?—It appears to me that there would not have been any; that a most simple apparatus would be quite sufficient to secure the good ventilation of the worst ends which we could meet with in any of the Cornish mines.

334. What is the minimum supply of oxygen with which a workman could pursue his work ?—I can scarcely venture to say, but I should think that if we got only two or three parts less than what I have stated, for example, if we had had only 12 or 13 of oxygen it would be destructive.

335. The natural air has about 21 per cent. of oxygen, and the supply at which it would be impossible to prosecute labour, would be 12 per cent ?—I should say so ; from 12 to 16 I should think.

336. (*Mr. Holland.*) That would be suffocating air ?—Yes.

337. (*Dr. Greenhow.*) With what diminution of the natural quantity of oxygen could men work healthfully in a mine ; how much of the 21 parts might be taken off without injury to the workmen ?—I should judge that even with 18 they would suffer considerably.

338. (*Mr. Austin Bruce.*) Can the ventilation of a level, with any amount of care, be kept up to that of the outside air ?—Perfectly so. There is no reason why the air in all the levels should not be as good as on the surface of the mine.

339. (*Mr. Kendall.*) Generally speaking, excepting those levels to which you have referred, is it not so ?—Yes, with the exception of those ends.

340. (*Mr. Austin Bruce.*) Throughout the workings of a well-conducted pit what should you say was the supply of oxygen ?—With those exceptional cases, I should say that you would find no difference between the oxygen there and the oxygen in the atmosphere ; you would find it 20 and above.

341. (*Mr. Kendall.*) Before you made your examination, on the day when you suffered so much, had there been any blasting in that end ?—Neither in the end of the Consolidated Mines, nor in the end at East Pool, had there been any blasting. I know that for a fact, from the circumstance that I was then underground trying experiments on the electricity of the mineral lodes, and spent some hours there, and I was in the end at East Pool mainly for the purpose of making a connection with the lode.

342. Did you ascertain for how many hours the men worked in that end ?—My impression is that in both those cases the men only worked two or three hours.

343. How long did they stay away in order that the oxygen might accumulate ?—I fancy that they did not work more than half their time, that is to say, only four hours out of the eight, requiring the other four to recover from the effect of their work.

344. (*Mr. Davey.*) They would not work eight hours in that mine ; there is a greater number of men ?—Yes.

345. Instead of six men working for eight hours, there would be eight men working for six hours, or for five ?—Yes.

346. (*Mr. Holland.*) How were these specimens of air gathered for the analyses ?—By taking down Winchester quart bottles, which were filled with water. In the particular cases of which I speak, those bottles were filled with very pure rain water, on the surface, and taken down ; they were emptied in the level, and of course filled with the air of the level, and then brought up.

347. Would not some of the gases in the air be washed out by the water which was running out of the bottle ?—That would, of course, be one small source of error. The water in the bottle would absorb carbonic acid, or any other gaseous product which was in the air and soluble in water. But the water which was remaining in the bottle was examined, and the few drops of water which remained about the bottle were found to contain sulphates, and sulphuretted hydrogen.

348. Did not the water which had run out of the bottle contain still more ?—Yes ; the air, of course, would have taken some, and the water in the bottle would have had time to have absorbed it from the air. But I may also state, that two or three of those very experiments were confirmed by taking down bottles of mercury, and filling the mercury bottles in the same way as the water bottles had been filled.

349. Those would be small bottles ?—Yes ; capable of carrying about half a pint, holding about 7 or 8 lbs. of mercury.

350. Sulphuretted hydrogen would hardly be found in such small quantities ?—No.

351. Would it not be better to repeat that experiment by tubes, without water ?—It is a very desirable thing to be done. It is a very important inquiry ; and no doubt we now have means at our command for collecting the air, which would relieve us from the sources of error which certainly prevailed in those earlier experiments, although with the mercury there was no actual error, except the absorption of a small quantity, which was acknowledged.

352. You would strongly recommend a repetition of those experiments ?—Most assuredly.

353. (*Dr. Greenhow.*) To return to the fast ends from which you procured the air for analysis ; are these ends found in all Cornish mines ?—They must exist more or less in all mines.

354. These are more particularly the places in which the men are employed at work ?—They are, of course.

355. Will not the greater proportion of the miners actually be working in such ends ?—No, not the greater proportion ; a large number will be working there, certainly.

356. Would you say a large proportion or a large number ?—I should rather say a large number.

357. You would say then that a large number of men are working in fast ends, the air of which is more or less deprived of its oxygen, as in those ends of which you have spoken in the Consols mine ?—I must be guarded, not to condemn all Cornish mines, because there are many in which they are very careful to secure the ventilation ; but taking the average of the mines, I am afraid that there is a good deal of neglect in that respect, which it is very desirable should be corrected, and the men do suffer from working in such ends.

358. (*Mr. Kendall.*) Taking mines on the average where there are 400 men working underground, what proportion of those men, do you think, are working in those dangerous ends ; are there 5 per cent. ?—Not 5 per cent in dangerous ends

259. (*Mr. Austin Bruce.*) What is the physical state of the men when they leave their work, in those places when they are only able to work for two hours at a time ?—That of extreme exhaustion.

360. Do you suppose that that exhaustion can be frequently repeated without permanent ill effects to the health of the workmen ?—Most assuredly not: and there is no doubt that it is one cause of the diseases to which the miners are subject.

361. (*Mr Davey.*) Do you find that extreme ex-

haustion in the case of men who come up by the man engine ?—Not to the same extent certainly, for the extreme labour of climbing added to the labour where there is a deficiency of oxygen, increases that exhaustion ; but where a man comes up by the man engine, or is brought up by the skip, so as entirely to relieve him from any labour, he will still complain of the effects of a close end.

362. (*Mr. Holland.*) Do you recollect the percentage of oxygen in air which has been once respired, is it not 16 or 17 per cent. ?—From experiments which have been made, more particularly by Dr. Angus Smith, I think that it is about 17·10.

363. Then this air in these bad ends is in just about the same condition as regards the deficiency of oxygen as air which has been once respired ?—Exactly so.

364. (*Mr. Austin Bruce.*) What are the diseases to which this state of exhaustion would, in process of time, expose a miner ?—Bronchial diseases generally.

365. Is it found that bronchial diseases abound much in Cornwall among miners ?—They prevail amongst the mining population.

366. The general temperature of Cornwall, I suppose, is very favourable ?—Cornwall may be regarded certainly as an exceedingly healthy county, the average duration of human life being high. But we must not confine the so called miners' consumption, or those bronchial diseases, to the mines of Cornwall, since they prevail, even in the shallow mines of the north of England, to nearly the same extent.

367. (*Dr. Greenhow.*) Even to a greater extent, do they not ?—Possibly to a greater extent in some districts.

368. (*Mr. Austin Bruce.*) I presume that working in hot air under all circumstances would expose them to bronchial diseases ?—Unquestionably. Inducing exhaustion, and especially with the severe kinds of toil to which the men are subjected, such as the practice of beating the borer under the circumstances in which they are placed, and the conditions of climbing in the deep mines, which are very severe ; the effect of climbing being, of course, to induce an extreme action of the heart, and the men in a great majority of cases commencing their lives with a low amount of vitality.

369. Then a certain tendency to bronchial disease would arise from working in the best ventilated mine from the inherent circumstances under which mines must be worked ?—There are several causes in operation to produce bronchial diseases. The condition of the atmosphere is one, the elevated temperature is another, the breathing of fine dust from many of the rocks in which the men are working is another, operating in the same way as the dry grinding at Sheffield produces disease.

370. (*Mr. Kendall.*) Where do you find the fine dust ?—In any of the hard siliceous rocks.

371. (*Mr. Austin Bruce.*) Is there any other cause tending to produce bronchial disease ?—There is also a very serious one, namely, the incautious way in which the men will go into a level before the gunpowder smoke has cleared off. I am merely stating my opinions upon these points, those opinions being founded upon a partial medical education, having left the profession of medicine for the science of chemistry. I have been, however, in the habit of looking at things from that particular point of view.

372. (*Mr. Kendall.*) Will you explain the point with regard to the gunpowder smoke ?—Of course in firing a hole or a series of holes, there are generated numerous gases which float for some time, not merely the carbonaceous matter which you see floating as visible smoke, but in addition to that there are gases of a deleterious character mixed and floating in the air: the men by exposing themselves to this influence almost immediately suffer from some irritation of the mucous membrane, either sneezing or coughing, or some condition of that kind. The men do incautiously expose themselves in the level to those influences sooner than they ought to do.

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373. (*Mr. Austin Bruce.*) And the danger is always, of course, greatest where the supply of fresh air is least ?—Undoubtedly.

374. (*Chairman.*) You have spoken of small dust, is that from the rock where they are working ?—That must only be looked upon as an occasional cause.

375. (*Mr. Kendall.*) Is it not very seldom ?—Yes, it only occurs in some very few districts. You will find it for example in the Wheal Alfred district, in the great Green Stone Dyke, and wherever there is very hard rock to work through ; there, the men are very liable to it.

376. But while they are working that rock, do they not use water for the hole ?—Yes, in some cases, but with the heat below this dust accumulates, and I have noticed the influence of its action very curiously in some cases.

377. However, the smoke is a matter of much more moment ?—Yes.

378. Is it not a very common thing that the miners themselves, in order to see what effect their blasts have produced, rush in and take perhaps their coats and drive the smoke before them ?—I have often seen that done.

379. Of course there is a great deal of disease among miners ; from which cause does it arise most ; their own carelessness, with regard to smoke, or from their working in bad ends ?—I think that I must strike a balance between the two in giving opinion. I am strongly persuaded, that a better system of ventilating the ends in the Cornish mines, should be adopted, for the sake of the miners. At the same time, I am equally well convinced that the miners partly through recklessness, and partly through ignorance, expose themselves to influences which are injurious to them.

380. (*Chairman.*) Would there be any means which could be adopted, except by the men leaving their work for some time, and getting rid of that smoke and the evils attending it ?—Means might be adopted, and I believe that it would be found, in many cases, to be very economical to adopt means to pump out that air.

381. To pump out the smoke ?—Yes, and thereby to remove it very rapidly from the end. At the expense of a few pounds to the mine a ventilating arrangement might be adopted in those particular cases, by which the end could be cleared of smoke, in, say from 10 to 15 minutes, or even in less time than that, so that the men could resume their working with safety to themselves, and I believe that there would really be all that gained in time to the adventurers of the mine, in the labour.

382. Can you state how long, in ordinary cases, it would take before the men could safely return to their work after a blast ?—It varies very much, according to the general conditions of the mine ; it may be only a period of minutes, or it may be an hour or more.

383. (*Mr. Kendall.*) Does it ever exceed an hour before they can safely go in ?—I have known it to exceed an hour, certainly.

384. (*Chairman.*) Do you suppose that it depends upon the size of the level or upon any other circumstances ?—It entirely depends upon the movement of the air in the mine.

385. (*Mr. Holland.*) If there were something like 10 feet of air in a second in a copper mine, as in a coal mine, the interval after a blast would be very small indeed ?—In a coal mine the smoke is swept away in a very few minutes.

386. (*Dr. Greenhow.*) You have spoken of certain means which might be adopted to drive out the smoke from these fast ends. Will you be good enough to describe those means ?—The most simple means, and the one perhaps least liable to derangement in the hands of a miner, would be that of the ordinary ventilating fan ; by adopting the influence

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of centrifugal force, the same as is adopted in Nasmyth's fan, throwing off the air from the periphery of the fan. In that way the air could be most rapidly moved through a pipe from the level.

387. (*Mr. Holland.*) Would not the simplest way be to ventilate the entire mine as a coal mine is ventilated ?—It would not pay.

388. (*Mr. Austin Bruce.*) What is the general physical appearance of the miners ?—Not healthy ; there is a certain amount of pallor about them. The young men, you will find, are apparently healthful, but after the age of 28 or 30, you begin to see the influences of their labour upon them.

389. Up to what age do they continue to work in the mines ?—It varies very much in the different districts, but the average duration of a working miner would be somewhere between 30 and 32 years.

390. Do you mean 30 or 32 years of work ?—No, of age.

391. I presume that that takes in the average of life generally throughout the district, including infants ?—No ; it is the average of the mining population.

392. (*Mr. Kendall.*) On what data do you found that statement ?—Mainly upon the data which we find in the papers, which have been communicated to the Cornwall Polytechnic Society by Dr. Carlyon, Mr. Lanyon, Mr. Blee, Dr Barham, and others.

393. Have those data ever been disputed ?—I am not aware that the data of those gentlemen whom I have named have been disputed, but the data by Mr. Couch certainly have been disputed.

394. (*Mr. Davey.*) What is the difference between the statements of those gentlemen whom you have mentioned, and of Mr. Couch ?—Mr. Couch makes out the worst possible case, as it regards the miners. He represents their sickness as being greater, and their average duration of healthful labour as being less than the others do, and it has certainly been questioned whether or not he is correct in the data upon which he has founded his statements.

395. (*Mr. Austin Bruce.*) Can you compare that average of life with the average of life in any other special employments ?—Those are points which I have not specially gone into, but having now, for a long period of years from time to time, been interested in the question, the inference which I have drawn from my reading and examination of the subject is, that the average duration of the metalliferous miners' life is certainly low. It is only a few nights ago—since, indeed, the Commission has been named—that I was referring to some data, and they have quite confirmed my views with regard to this point, that we must reckon metaliferous mining as amongst the few of the very unhealthy employments of the people of this country.

396. At what age do they begin to work ?—They begin to work underground at about 16 years of age ; it is very rarely that they begin much younger than that. I have known some few younger boys than that, but they have not often, I think, been under that age.

397. You have stated that the general average of life of the population of Cornwall is high ?—Yes.

398. Do you consider that it would be higher still but for the large proportion of the population employed in mining operations ?—The mining population would not make any particular difference, I take it.

399. Do you consider the average of life of the mining population as high as that of the non-mining population ?—Most assuredly not.

400. Then the average is reduced by the mining population ?—It would make some difference, but the difference would be slight upon the whole mass of the population.

401. What proportion does the mining population bear to the whole mass of the population of Cornwall ?—At the moment I fear I cannot correctly answer your question. I should suppose about one fifth ; but I must not state that as being absolutely correct.

402. (*Mr. Kendall.*) Not one fifth of those who are under ground are exposed to these hardships ?—No.

403. (*Mr. Austin Bruce.*) Have you yourself observed any difference between the appearance of workmen in one mine and in another ?—A very great difference indeed.

404. Will you be good enough to describe the difference which you have observed ?—If we look at the workmen in the district of St. Agnes, which is a mining district, we find there that they are comparatively healthy and strong. If we go into the Gwennap district, only six miles off, we shall find there, on the contrary, that they have generally an unhealthful appearance ; and there are other districts where you perceive the same differences between the miners.

405. To what cause do you attribute that difference ?—The causes are not very evident. I think that that is one of the points which the Commission will succeed, perhaps, in working out. In St. Agnes we have them mainly working in tin mines, which are proverbially more healthy than the copper mines, and in the Gwennap district they are mainly working in the copper mines.

406. Why should tin mines be more healthy than copper mines ?—I do not know.

407. Is the depth at which they are worked the same ?—The depth of the St. Agnes mines and of the Consolidated Mines is not the same ; they do not work so deep in St. Agnes as they do in the Gwennap district.

408. Do you trace the difference between the health of the mining population of one mine and of another to other causes than that arising from the want of proper ventilation and the supply of proper mechanical contrivances ?—There certainly appear to be some causes in operation which I do not understand, producing differences similar to those which I have named as existing between those two particular parishes. The returns of deaths in St. Agnes will show you miners living to a very advanced age. On the contrary, the burial returns in Gwennap and St. Day, which are neighbouring parishes, will show you miners dying young.

409. Is that owing to causes in existence above ground or below ground ?—I do not feel at all able to state the causes upon which those results are dependent. I have looked at the fact, and I have endeavoured to arrive at causes, but none of them have been satisfactory to myself. The general opinion is, that it is more healthful if they work in a tin mine than in a copper mine, but I do not know why that should be so.

410. (*Mr. Davey.*) You say that there is a difference between the parish of St. Agnes and Gwennap. The mines in St. Agnes are not so deep as those in Gwennap ?—They are not.

411. Are you aware of the conditions attaching to the miners of St. Agnes ; whether they work in the mines the same length of time in a day as at Gwennap ?—Usually, I think so.

412. Are you aware that a great portion of the miners in St. Agnes have home occupation ?—Yes.

413. And St. Agnes being on the north coast, facing the Atlantic, have they not a greater advantage than at Gwennap ?—That, on the first blush of it, would perhaps appear as a sufficient cause ; but when we look at St. Agnes on the north coast, and then at the hills of the Consolidated Mines, which are only at a distance of five or six miles from that coast, I do not think that that can be a sufficient explanation of the differences. I think that we shall have to look to some deeper causes ; some more subtile influences.

414. (*Mr. St. Aubyn.*) Have you compared the condition of the miners at St. Agnes with that of the miners at St. Just, where they are as near the sea ?—At St. Just the condition of the miners appears to be unfavourable.

415. But they are equally near the sea ?—Yes.

416. Then you cannot ascribe the healthiness of the miners of St. Agnes to their being near the sea ?—No ; that is the difficulty which I have felt.

417. (*Chairman.*) Do the mining population in these different districts intermarry much ?—Very much indeed.

418. Is not that conducive to rendering their constitutions more liable to disease ?—As your Lordship has put the question in that form, my impression is that the mining population of Cornwall start into life with a low amount of vital power to begin with ; that the children are not healthful children. You will find them subject to strumous diseases of various characters. After overcoming the illnesses of infancy, (those who do overcome them) they then for a period appear fairly healthful, but by and by the diseases of infancy, or, at least, those which are analogous with them, begin to make their appearance; those strumous influences again present themselves. Therefore, there is no doubt, in my own mind, that the Cornish miner starts into life with causes which tend eventually, under the circumstances of his labour, to shorten the length of his days.

419. Should you think that there is anything connected with their dwellings which is also likely to render their constitutions more liable to disease ?—Not generally in their dwellings actually, but the sanitary conditions around their dwellings are in many instances very bad.

420. (*Mr. Davey.*) There are early marriages ?—Yes ; and also we must remember the conditions of the women working at the mines, unfitting them for those habits of domestic economy which would tend to the improvement of their dwellings.

421. (*Chairman.*) With respect to the quality of the food of the miners what have you to state ?—The food of the Cornish miners is poor generally speaking; it is insufficient, in my opinion, for the labour which they have to undergo. Their potatoe pasty furnishes them with a very small amount of the nutritive element which is necessary, there being but a very small amount of nitrogenous matter in a mess of potatoes, with the very little bit of meat which it contains, and then their diet of fish and potatoes is a variation from their pasty. It is true that a due amount of fish would give them the nitrogenous principle in quantity, but the amount of fish which they get is in many of the districts also very small. Their diet is made up mainly of vegetable matter.

422. Then there is a difference in the case of the Cornish miners from what we have heard of the lead miners, namely, that meat is not a considerable part of the diet of the Cornish miners?—The wages which are obtained by a Cornish miner are insufficient to allow of his getting that amount of meat which really appears to be necessary for the enjoyment of health under all the conditions of his labour. It is very different indeed from that which is got by the colliers, for those men live particularly well. On the contrary, the Cornish miners fare but badly—insufficiently.

423. What is the average of the wages of the Cornish miners ?—The wages of tutwork men, that is to say men working in the ordinary way by the piece, and not per month or per week, vary from 2*l.* 10*s.* to 3*l.* 1*s.* 11*d.* per month.

424. (*Mr. Davey.*) Is that the average of the county?—Yes. Then there is a system in Cornwall of tribute, which may be regarded as a system of sharing. The men work at so much, according to the quantity of ore raised. Those are called tributors. Sometimes a very successful tribute gives a man a considerable amount of money, and therefore I have taken the averages of a great many mines under ordinary circumstances, where the adventure has been a fair one, and I find that their wages then will amount to from 2*l.* 15*s.* to 3*l.* 11*l.* 7*d.* per month.

425. (*Mr. Fulke Egerton.*) What is the usual mode of paying wages ; are they paid fornightly or monthly ?—It varies ; they are usually paid monthly and bi-monthly, having subsistence in the interim.

426. (*Mr. Austin Bruce.*) Do you not conceive that those wages are sufficient to supply a proper amount of food to support the workmen ?—Where the men have families the wages appear to be insufficient ; however, it must be admitted that there is a good deal of improvidence, and of want of good domestic economy in the use of the money. With regard to other wages there are surface labourers, who I find get from 2*l.* 2*s.* to 2*l.* 5*s.* per month.

427. (*Mr. Holland.*) A month of four weeks ?—Yes.

428. (*Chairman.*) You mean labourers at mines on the surface ?—Yes.

429. (*Mr. Austin Bruce.*) Are those the wages of grown men ?—Yes.

430. (*Mr. St. Aubyn.*) You do not include in that the women who work at the surface ?—No.

431. (*Mr. Davey.*) Are these men who earn 40*s.* per month, able-bodied men generally ?—I have taken them as fairly representing the surface workers generally.

432. But the surface workers generally are not able-bodied ?—They are not. Boys earn from 13*s.* to 1*l.* 8*s.* per month, and females from 12*s.* to 18*s.* per month.

433. (*Mr. Kendall.*) The food in Cornwall is cheap on the whole, is it not ?—Yes.

434. They get a quantity of fish at times, very cheap ?—Yes.

435. And potatoes very cheap ?—Yes ; most of the miners grow their own potatoes.

436. From your knowledge is the miner provident or improvident ?—That question requires, perhaps, a little qualification ; I should say, speaking generally of the mining population, that they are provident in the ordinary sense of the word, but their domestic economy is not good, it wants a better direction.

437. Is their mode of pay good ?—I think not.

438. Will you explain where you think that it is defective ?—One cause particularly is the system of paying the groups of men, and then their going to the public houses to share their money, which leads them to expend more than it is desirable that they should expend in drink.

439. (*Chairman.*) Are they paid at public houses ?—No, they are paid at the mines, but they very commonly receive their money in gangs or in bodies of men, and this is divided amongst them at a public house where they go and have their drink.

440. (*Mr. Davey.*) In what manner are they paid ?—Generally speaking they are paid in notes and sovereigns, and therefore they often have to go to the public house to get them reduced to smaller coin.

441. (*Mr. Kendall.*) Supposing that a man has to receive 20*l.* and a few shillings, to divide that amount among his comrades, how will he receive it ?—In all probability in two or three 5*l.* notes, and a little in gold, which he has to change and divide.

442. If it is a round sum, is it generally all in notes ?—Very frequently.

443. Do you know what they are expected to expend at the public house ?—I cannot speak upon that point.

444. (*Mr. Davey.*) That is not the case in all mines ?—No.

445. In some mines they are paid separately ?—Yes.

446. (*Mr. Kendall.*) Can you give any reason why that mode of payment should be adopted in mines ?—No earthly reason except the mere convenience of the clerks.

447. (*Mr. Austin Bruce.*) You have stated that the domestic economy of the miners is bad ?—Yes.

448. Is it worse than that of other populations in England ?—I rather think that it is worse than in

the populations which are not manufacturing; where the women are not employed in manufactures.

449. Do you know any part of Great Britain in which the domestic economy of the working population is satisfactory, so as to make the most of their resources?—We certainly very frequently find that they do not do so; but I think that there are many districts in which you find them superior to the population in other districts.

450. Which would you mention as the best?—Many of our better class of agricultural districts are certainly, I think, superior; but there is no doubt that that is mainly dependent upon the influences which have been exerted by the educated classes residing in their neighbourhood, and taking an interest in them.

451. (*Chairman.*) Are there provision shops in the neighbourhood of the mines?—In all the mining villages provisions can be obtained, but not in all of them readily; for example, meat can only be obtained in many of them perhaps, once in the week.

452. The miners are in no way connected with the parties who keep these provision shops?—Not usually.

453. (*Dr. Greenhow.*) With reference to the age at which the miners break down; you have spoken of a remarkable difference between the miners of Gwennap and the miners of St. Agnes?—Yes.

454. Did your remarks apply to the present or to some former time?—My remarks apply rather generally to the fact that in St. Agnes we find a great number of old miners, which we do not find in Gwennap and St. Day.

455. You spoke of the age at death, and stated that there were a great many old miners at St. Agnes, but very few at Gwennap; does that refer to the last 10 or 12 years?—It refers to the period from 1851 to 1861.

456. Are you aware that there was a very large emigration from Gwennap during the earlier portion of that period, or shortly before 1851; that in fact a great number of the able bodied miners of Gwennap went to the gold diggings?—It was equally so from all the districts of Cornwall; and perhaps a still larger number, proportionally, went from the district of St. Agnes.

457. Then no fallacy can arise from that cause?—I would not say none; but I think not to any large extent. Of course those who left the district I regarded as able-bodied men generally, and so far it was a reduction, but I think that that would equally apply to St. Agnes as to Gwennap.

458. You have spoken of the age at which miners break down, and you have said that their breaking down has generally been after 30 years of age?—I should say from 27 to 32.

459. When you say that they break down, do you mean that they cease to be able to work at so early an age?—I do not say that they exactly cease to work, but they begin to complain of shortness of breath, and of asthma, and they also complain of stomach diseases and general debility.

460. But they continue to work for some time after the appearance of these symptoms?—Yes; they have also a good deal of expectoration, which is a constant source of complaint with them.

461. Have you any notion at what age they break down finally, and are unable to work, taking the average?—With regard to those men, I have seen cases where they have gone on labouring for some three, four, or even five years, and other cases where they will die off within 12 months from their first complaining. In some cases, supposing a man begins to complain at 27, he may perish before he is 28, or he may linger on till he is 30 or more.

462. Practically, in your opinion, there are very
er 40 years of age?—Very

atistics from which we could
ese facts; you are now giving your impression, I understand?—I have no statistics upon those points.

464. This is then only your impression?—This is only my impression; in truth, I may state that my impression is, that the Commission has yet all that work to do to get out the true facts of the case.

465. (*Mr Kendall.*) You have been underground a great deal in your lifetime; how frequently?—Of late years not much, but during the time that I was resident in Cornwall, perhaps a quarter of my time was spent in the mines, and that was a period of some five or six years. Since that time I have been frequently underground.

466. You fancy that very few men above the age of 40 work in mines?—But few out of the mass of the men; here and there you will find men much older, but they are but few.

467. As I understand you, you think that the Commission will have to clear away a good deal of difficulty with regard to the ages of men and the data given?—They will have to clear away some amount of hypothetical statement, and a very large amount of conclusions which have been drawn from false inferences by men who have started with a theory, and have made their facts bend to the theory.

468. (*Mr. Austin Bruce.*) Is the number of deaths from accident great in Cornwall?—Not very great.

469. What accidents take place in the mines?—They arise from the falling away of men from the ladders and occasionally the falling of masses of stone and things upon them in the shaft. Then again, they arise from the explosion of a hole prematurely, or from the men picking out a hole when it is not fired, and igniting the gunpowder in the process.

470. Have men ever complained to you of deficient ventilation or of deficient precautions being taken for the preservation of their health?—Many times.

471. Have they ever suggested to you any means to be taken for the improvement of their health?—Yes; they have frequently stated, "If we could only persuade the adventurers," or the agents, as the case may be, naming them, "to spend a little money, we "should be in a very much better condition; we "should not be obliged to labour under the difficulties "under which we do labour."

472. Who superintends the ventilation of these mines?—All the superintendence of the mines is left entirely in the hands of the principal agent.

473. Are there men analogous to the foreman in collieries?—There are no analogous men to those at all.

474. (*Dr. Greenhow.*) Are there no overmen?—No.

475. Nor under viewers?—No; the occupation is not at all parallel. We have the principal agent of a mine who has the chief supervision; then we have mines where there are two or three agents, who have more particularly to direct their attention to the underground workings; they stand somewhat in the relation of overmen to those who are working under them, but their occupations are not similar.

476. (*Mr. Kendall.*) Do you state that you are satisfied in your own mind that there are simple remedies, which are patent to the agents and to the men themselves, but which are often not taken advantage of, solely on the ground of a false economy?—I do.

477. With regard to the diet; have you watched the diet of the miners lately, and did you watch the diet some years ago?—I have been continually looking at their diet.

478. Do you think that their diet is improved?—I do not. I think that their broth and their potatoe pasty, and so on, remain pretty much as they were.

479. (*Mr. Davey.*) Are you not aware that some years ago there was a great proportion of barley bread?—Yes.

480. Do you ever see that now?—We do not.

481. (*Mr. Austin Bruce.*) Do you attribute the low vitality in the children to hereditary causes

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arising from the employment of their parents in mines?—To those causes, associated with the close intermarriages which prevail in Cornwall, to a great extent.

482. (*Dr. Greenhow.*) Do you mean intermarriages of consanguinity?—Yes.

483. (*Mr. Austin Bruce.*) Do you mean that the mining population of Cornwall do not, as a rule, intermarry with the agricultural population of Cornwall?—I should rather say that within any defined area you will find that the marriages are mainly amongst the families residing within that area. A man in St. Agnes rarely goes to Gwennap for a wife, and it is a proverb that a man in Redruth would not think of marrying a Camborne woman, although the places are only three miles apart.

The witness withdrew.

Adjourned to To-morrow at two o'clock.

Friday, 28th March 1862.

PRESENT:

The Right Hon. Lord Kinnaird, K.T.
The Hon. A. Fulke Egerton, Esq., M.P.
Nicholas Kendall, Esq., M.P.
H. Austin Bruce, Esq., M.P.
John St. Aubyn, Esq., M.P.
E. Headlam Greenhow, Esq., M.P.
Richard Davey, Esq., M.P.

The Right Honourable Lord KINNAIRD, K.T., in the Chair.

Warington Smyth, Esq., examined.

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484. (*Chairman.*) I believe that you are employed by the Government as an Inspector of Mines?—I have to inspect the Duchy Mines in Cornwall for the Duke of Cornwall, and I also, for the last four years, have had the inspection of all the minerals belonging to the Crown, including a few mines only properly so called, and a great number of slate quarries, and extending principally, going northwards, from the Forest of Dean to North Wales, the Isle of Man, and Yorkshire.

485. What number of mines belong to the Duchy of Cornwall?—Those are altogether separate from the Crown. To the Duchy of Cornwall there are belonging generally, I should say, on the average, for they vary very much up and down, from about 70 to 100 sets, in which more or less working is going forward; but perhaps out of that whole number I might say that 50 are such as would deserve to be called mines, employing on the whole from 4,500 to about 5,000 persons.

486. (*Mr. St. Aubyn.*) Does that include those mines of which the Duchy is part owner?—Yes, several; two or three amongst the rather large ones.

487. (*Chairman.*) Have you had experience of any foreign mines?—I have travelled through several of the mines in all the most important districts, excepting those of Scandinavia. I have examined a number of the most important mines in the Hartz, in Saxony, throughout the whole of the Hungarian districts, that is to say, the Lower Hungary as well as the Eastern Hungarian, and those of the Banat, those of Austria, those in Carinthia and Styria, and a few mines in Spain and in France.

488. How long have you been engaged specially in business connected with mines?—About 24 years.

489. Do you consider that there has been an improvement in the working and management of mines which have come under your own knowledge in this country?—I think that it is quite evident that during the last 60 years a very important improvement has been made, taking the mines generally, as regards the health of the workpeople, principally in consequence of its being seen to be consistent with economy, as well as to the advantage of the men, to drive larger levels. The works executed at the beginning of that period and in the last century were, generally speaking, on a very confined scale; the levels were very small, but those executed within the last 50 years at all events have been, generally speaking, such as to admit of better ventilation. I speak of the openings generally, and the excavations.

490. Do you consider that of importance for ventilation, as well as for the working of the mines economically?—Undoubtedly that has been a point of great importance. I can speak of it in a mine which I have been working myself in Cumberland for some time. We found it worth while to drive the levels fully twice the width of what old levels used to be, because then we could drive an extra distance without any necessity for artificial means of ventilation. We could drive with ease 40 or 60 fathoms, the levels there being carried as much as six feet wide and seven feet high. I should add that one reason was, that the rock was very hard, and our men asserted that they could blast that width at almost the same price as they could the smaller levels which they used formerly to drive.

491. Does not it depend at all upon the nature of the bed?—It depends very much upon the nature of the bed, because if the lodes themselves are small there is very little inducement to blow down dead ground.

492. But where the lodes are very small, you would think it an economical matter for the ventilation that the levels should be made of a certain size?—It is rather a complicated question; it depends so much upon the hardness of the ground. You may get to an extreme either way; either the ground may be so hard as to be very expensive to shoot, or it may be so soft that if you open a large size you may require a very heavy expense for timber; so that it must very much depend upon the judgment of the manager to drive the right medium.

493. When the ground is soft, what is generally the nature of the rock; or do you come across different strata?—That would depend upon the character of the lode, just as well as of the ground which it is in. If the ground is hard, there is trouble in shooting for any considerable width; and if the ground is soft, it is perfectly out of the question to open very large spaces, because they cannot be secured.

494. Where the ground is of that description, are the levels secured by props and timbers?—By a compound arrangement of timber; generally speaking, by three pieces, two uprights and a cap.

495. (*Mr. Davey.*) There are also planks at the side of the level, I presume?—Yes, if the ground is apt to break away piecemeal.

496. (*Chairman.*) What other means of ventilation have you in the mines with which you are connected besides the mere level?—Generally speaking, in all the mines which I have to do with, other than coal mines, we trust entirely to the natural ventilation—that is for ventilating the central parts of the mine. But during the progress of every mine, there must at times be certain spots, what are called close ends, where there is a deficiency of air; and in order to introduce a sufficient current into them, some ventilating machine or other is applied, but merely as a temporary expedient until we have an opening further

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round, through which a sufficient current can be brought.

497. In the mines with which you are connected, do you invariably use some machine when you are working one of those ends?—Almost invariably. There are machines of several kinds employed in all the larger mines. They always have some of them ready to put into any close ends of that kind, either a fan, or a duck machine, especially if they have a pumping shaft near to the place, and if they can attach a machine of the sort.

498. That becomes necessary from the exhaustion of the air?—It becomes necessary from the stagnation of the air beyond the line of a definite current, but simply as a temporary expedient.

499. But it is also from the exhaustion of the air from people working there?—The reason of the deterioration of the air is, of course, a very compound question. It is partly due to the mere stagnation, but it is also partly due to the breathing of the men, the requirements of the lights, and the use of gunpowder, and the decomposition of several of the minerals going on; all those causes tend to take away the oxygen from the air, and to introduce mischievous gases, such as carbonic acid, and sometimes sulphuretted hydrogen.

500. Are there any means by which you can get rid of the effects of the gunpowder immediately after a blast? The men are obliged to leave I, presume?—They are sometimes for a long time; and in many of the mines they are obliged to lose a great deal of time, in consequence of the end or the face where they are working being advanced, perhaps, a good many fathoms beyond the current of air. In cases of that kind it is necessary, in order to obviate that waste of time, that they should have some machine; and generally speaking those machines are either worked by a man or a boy, or if they have an opportunity they are worked by engine power.

501. Is that to abstract the smoke, or is it to introduce fresh air?—They are sometimes worked in one way and sometimes in the other, and there is some uncertainty as to which is the best method. I cannot say that the same thing would be the best in all cases. Sometimes the object is to withdraw vitiated air, and sometimes to force in fresh air, and so push out the vitiated air.

502. Those are the two systems which are adopted?—Yes; the air either being withdrawn, or being propelled into the works through what are called air pipes or air boxes.

503. When the fresh air is introduced, where is it taken from in those cases?—Generally speaking, from the nearest shaft.

504. Do you know anything with regard to the cost of driving those ends?—Yes; that is an item which enters into one's every day's observation underground.

505. And that, of course, varies, in some respect according to the material, whether it is granite or some other material?—It varies from day to day. The real value of the ground varies from day to day in every place which is being worked. It does not depend simply upon the name which you give to the stone, because every kind of rock is met with in so many different physical conditions, as to its being more or less soft, or as to its being divided by joints, that no sort of general rule can be laid down for the price which is to be given for ground.

506. Is that work done by contract?—Almost invariably by contract; what is called dead-work or tut-work.

507. Is it a contract for so much by the piece?—So much per fathom is the usual mode of determining it in all the metallic mines.

508. Are the miners judges of the cost of that kind of work?—Yes, in most cases; but you may have green hands, whom one does not very often see underground. The miners have a very good idea indeed of what are proper wages, depending, of course, upon the nature of the ground as they see it; but then it is more or less speculative whether the ground may turn in their favour or turn against them, before the period of their bargain expires.

509. Would it make any difference in the price which you would pay for a contract whether the end was ventilated or not?—A very considerable difference.

510. For an ill-ventilated end you would have to pay more?—Undoubtedly.

511. How long can a man work in an ill-ventilated end at boring?—The matter is so very comparative that it is difficult to give a decided answer. There are some ends so bad that if one happens to descend the mine in the summer, when the external temperature is high and when there is very little movement in the air, you cannot, perhaps, get into the end at all. I have seen in the North of England some places where carbonic acid appears to ooze out under such circumstances, and to fill the working places to such an extent that the men cannot go on with their work at all in such weather; but those are exceptional cases.

512. But where there are artificial means of ventilation the men can work longer at the end?—They have then, of course, much more chance of getting rid of the foul air.

513. Except for the ends, the ventilation, you say, is generally natural ventilation by the different shafts?—Yes.

514. Is the heat in the mines affected by the external heat?—Very little.

515. The ventilation is affected by the state of the atmosphere above?—Certainly; that is to say, in a great many mines one finds that during one portion of the year the air has a tendency to flow in a certain direction, and through another portion of the year to flow in an opposite direction; and if you happen to come to the mine at an intermediate part of the year when the difference is not so marked between the temperature of the external air and of the internal air, then it is very possible you may find the ventilation very dead. With reference to that question, it would, perhaps, be worth while to state that for the last few years I have generally been in the habit of carrying with me a large trustworthy thermometer underground, and have made a number of observations whenever I have visited any of the deeper mines for the purpose of seeing how the ventilation was affected by the temperature, and also for the purpose of seeing what was the temperature of the hottest places, of the worst ends, in fact, of the mine; and I must say that in most cases where the levels are kept of a sufficient size, and the shafts are not too few and are not too much occupied by machinery, the results are extremely satisfactory. At the worst of the ends, generally speaking, taking a long series of mines, unless where there was some local cause, the temperature did not rise above 84 degrees. One of the most remarkable mines which I have visited on behalf of the Crown is the Levant mine, which is worked at a great depth, a total depth of 240 fathoms from the adit, that makes nearly 270 fathoms from the surface.

516. (*Mr. Davey.*) That is near the Land's End?—Yes. It is opened in very complicated workings; that is to say, on different lodes up to a distance of about half a mile under the deep sea. The mean temperature of that district of Cornwall throughout the year is, I think, about 52 degrees, as far as I can judge from observation. At grass, before going underground, I found on a certain day in August 1858, that the temperature was 61½. At the 130 fathoms level the temperature was 78; at the 190 fathoms levels it was 81; that was the highest temperature in the mine on that day. That was on the north lode, which is almost at the extreme distance of the entire working under the sea.

517. (*Mr. Austin Bruce.*) Was that a close end?—It was. On another day in May the external temperature in the shade was 65°; at the 100 fathoms level in the engine shaft it was 68°; and that engine shaft, I must say, is so well fitted with ladders and so

well arranged, that I generally prefer to descend that shaft even to riding on the man engine, from its enabling one to look about and take any observations. At the 150 fathoms level they had driven a cross-cut very far from the south lode; and from the north lode, which was afterwards intersected by it, they had driven 40 or 50 fathoms, and the temperature there was only 78°.

518. (*Mr. Kendall.*) That is to say, going at right angles to the sea?—Yes. At the 170 fathoms level the temperature was 81 degrees, so that it was equivalent to the highest temperature before. On another day I found the same cross cuts about 78 and 81 degrees again. In fact I never got any higher temperature than 81 degrees there.

519. What appliances were there for forcing up the air into that close end?—There was nothing at all; it was the natural ventilation of the mine circulating sufficiently near the mouth of this cross-cut to keep a quantity of air passing into it. When I was last down that mine the end was between 70 and 80 fathoms from the air-way, that was a cross-cut. There are a number of shafts to that mine, but this end was very far from the shafts, because the shafts can only be on the land, but this was entirely under the sea. That is a striking case, and it struck me more because I had to climb over a pile of stuff about 10 fathoms in length, which filled up a great portion of the level, and when I got into the end I found an old miner, 66 years of age, very contentedly there doing his work. I sat and had a long chat with him, and he told me that he had worked in the mines of St. Just since he was seven years old.

520. (*Chairman.*) Are there many people working at that end?—No. The system of driving levels in all this district of St. Just or the Land's End is, generally speaking, to drive what is called single handed, so that there is only one man in an end at a time.

521. (*Mr. Davey.*) What priced ground is that?—About from 3*l.* to 4*l.*

522. Do they use gunpowder?—Now and then they do, but a great part of it was done with what they call a poker and a long picker, a sort of bar peculiar to St. Just.

523. (*Chairman.*) Was this under the sea?—That was far under the sea, at the extreme point of the mine, in fact. It took more than half a mile of walking under the water to get there. Similar workings are going on there to a depth of 210 fathoms from the adit, upon this communication, the level running first through the south lode, and then as cross-cuts, and then upon the north lode.

524. (*Mr. St. Aubyn.*) Have you had occasion to go down Botallack Mine, which is adjoining?—Yes; I have been down both Botallack and Wheal Cock every year.

525. Do you know the distance there under the sea?—The horizontal distance is nearly the same, but the first is a very simple working, because it is merely upon one lode.

526. Have you found the same results there with respect to the temperature under similar circumstances?—The temperature there was a little higher. In fact the ventilation in Botallack properly so called was rather unsatisfactory two years ago, I must confess.

527. Will you explain that?—I think I can explain it. The ground is of a different character, and one must always make some allowance for that. I believe that, generally speaking, where you find a quantity of black shale, especially if it contains disseminated pyrites, it will absorb a great deal of oxygen, and unless you have an extra strong current the air is apt to be rapidly deteriorated. The two deepest levels which they have been working at Botallack for many years past have been the 165 fathoms and the 180 fathoms, and two years ago I found a rise proceeding from the 180 fathoms level to go up to the 165 fathoms level in which the air was excessively hot; it was very nearly 90 degrees; I am now speaking from memory; I think that it was about 86; and there I found a man working, who told me that he had worked for the last 20 years always in the furthest end of Botallack, and that he preferred it to any other mine in the parish. He preferred the warm air very much in the same way that I suppose some of the classes who are better off like to go for the warm air of the south of France and Italy. He said that he had tried some of the cold air of mines on the top of the hills, and preferred the hot end of Botallack.

528. (*Chairman.*) Did you find the ventilation oppressive?—Exceedingly oppressive. I was bathed in perspiration the whole time that I was at the far end of the mine; a remarkable point about it being, that it is perfectly dry at the same time, and that there is a rapid decomposition going on with the evolution of certain sulphate salts. I should add, that at that time means were being taken for improving the ventilation, which were completed last year, and there is now a very good current of air indeed. The agents were then busy in completing an inclined plane driven from the extreme end of the land, which would go down into the vein, and intersect the furthest workings at a distance of nearly half a mile from the shore; so that they were providing a double current and an excellent ventilation. Last summer I was down there twenty fathoms below the 180 fathoms level, and the ventilation was then greatly improved. The worst mine of that district is the adjoining mine—of the Wheal Cock; that is part of Botallack, properly speaking. In 1859, I left a grass temperature of $63\frac{1}{2}$°, and found it at 125 fathoms to be 72°; at 135 fathoms not under the sea, 82°; and at 150 fathoms 84°. It was certainly higher than it ought to have been; and I remarked to the agents at the time, that the shaft was very unsatisfactory, it was very full of machinery; they had the disadvantage of only one shaft there, and the current of air undoubtedly has a difficulty in finding its way down and up freely.

529. (*Mr. Austin Bruce.*) Is that duchy property?—It belongs to Lord Falmouth, but when they get under the sea the Crown receives a part of the dues. Last year I found that a considerable improvement had been made by the sinking of a winze to a considerable depth. The temperature at the surface being 64°, it was at 185 fathoms, where before it was 82°, reduced to 73°; and at 150 fathoms where it was before 84°, it was reduced to 76°; and that temperature I do not consider too high for the depth. But it is a mine which it is very fatiguing to visit from other causes, such as the arrangement for travelling. The levels are very narrow in consequence of their being driven single handed; they are not high, and the ladders are ill arranged.

530. What is the ordinary size of the levels?—The average of levels driven in that district single handed, I should say, is about 6 feet 6 inches in height, by 2 feet 6 inches to 3 feet 6 inches in width. That is much smaller than the average of the Cornish mines, where double-handed work is used.

531. (*Chairman.*) Being single-handed, they feel that they do not require a larger space to work?—No.

532. (*Mr. Davey.*) Do you find the average of other mines beyond that?—Certainly, of the modern levels which have been made within the last few years. It is very commonly a condition of the bargain of the men, that the level shall be driven 7 feet high and 4 feet wide, and not unfrequently 5 feet wide.

533. (*Chairman.*) Have you visited many other mines in Cornwall besides these which have come under your own jurisdiction?—A great many. I have visited most of the important mines at some time or other; for instance, such mines as the Great Devon Consols and the Great Wheal Vor.

534. (*Mr. St. Aubyn.*) Have you been down Tresavean?—I was down Tresavean sixteen or seventeen years ago. I was down in the bottom of Tresa-

vein when it was open to 340 fathoms from the surface.

535. Do you recollect the temperature there?—I recollect that it was not nearly so high as one would expect; but I did not test it. That mine has been closed; all the deep workings have been full of water for some years past.

536. (*Mr. Austin Bruce*). Have you any control over the ventilation?—No definite control; I only advise with the agents on the subject; and generally I have been rather diffident in saying anything strongly on the subject, because so many of the metallic mines, it must always be recollected, are, as a condition of their existence, merely trials, merely the extension of one trial after another, and therefore there is always something in progress which is likely to improve the ventilation. There is such a material difference between a metalliferous mine worked up on a lode, or vein, or flat, or anything else except a regular bed, and a colliery, that you cannot apply the same reasoning to one as to the other; and a metaliferous mine being a mere series of explorations, one carried out after another, in the hopes of finding mineral, you cannot insist upon the same regulations being carried out there as you would if you had a continuous equable mineral deposit.

537. Have you any power, in the least, to interfere?—I might interfere in many ways, not definitely; they are bound to work in the best method.

538. I mean as to ventilation?—Ventilation is not specified.

539. (*Chairman*). Is the "best method" specified in the lease?—Merely that they shall work the mines in the best method.

540. Do you report to any one after inspecting the working of these mines?—I report to the Council of the Duke of Cornwall. As long as I have had to do with the Duchy mines, I have never found any difficulty about questions of ventilation; generally speaking, I have had to be very well satisfied with the ventilation of the mines. Sometimes if a close end was very bad, I should see whether it was not advisable to put up a rise, or sink a winze, to ventilate it; and in only one case that I have met with in ten or twelve years, has there been a mine so bad that I was obliged to report it. It was a very bad case, and we insisted upon it, that if they continued to hold the lease, they should sink a new shaft from the surface.

541. (*Mr. St. Aubyn.*) What mine was that?—A mine called East Budnick. I was disgusted with what I saw there. I should have been ashamed for any intelligent foreigner to have seen such a thing going on in the county of Cornwall.

542. (*Chairman.*) And they complied with the requisition?—They commenced; but the mine was poor, and before they accomplished the object, the mine was abandoned.

543. (*Mr. Austin Bruce.*) The driving of these close ends is frequently undertaken by contract by the workmen themselves, is it not?—Invariably.

544. The condition of the ventilation, I suppose, depends upon the lessee of the mine?—The lessee, generally speaking, knows little or nothing about what is going on underground; it depends entirely upon the captain,—upon the agent.

545. Does the captain provide for the ventilation of all parts of the mine under his charge?—Entirely.

546. (*Mr. St. Aubyn.*) In what class of men is the captain usually; is he an old miner?—They are principally selected from two classes of the miners; one part of them from man who have been brought up as working miners, to tut-work, and especially from old tributers, because they are supposed to be well up to the tricks of the trade, and can so keep a good supervision on the other tributers; and another class is selected from the pit-men and shaft-men.

547. (*Mr. Austin Bruce.*) I suppose that the question of ventilation is one which is very much discussed between the men and the captain?—Not very much, because in the case of most of our mines there is such a satisfactory state of ventilation produced by natural causes that no one thinks much about it.

548. Even in the close ends?—Even in the close ends, as long as they do not get away a considerable distance from the winzes.

549. What is the highest temperature at which you think the men can work, without danger to their health and without inconvenience?—I think that up to 84° one feels no very serious inconvenience, but I should very much prefer that it should never reach 80°. There are exceptions.

550. How many hours can a man work continuously in a temperature of 84°?—They work their usual core of eight hours.

551. Consecutively?—Consecutively, with the exception of those intervals when they retire from the place when a shot has just been fired.

552. (*Mr. St. Aubyn.*) Do they usually throw off their clothes to work?—Very commonly; if the temperature is above 80°, at all events, they throw off all but their drawers.

553. (*Mr. Austin Bruce.*) You have visited foreign mines?—I have visited a great number.

554. Have you compared the state of health of the miners in foreign mines with that of the mines in Cornwall?—I have generally, but not as a medical man would do.

555. As the general result of your observation, what would you say?—I would say that it depends not only upon the temperature and the ventilation of the mine, but partly upon the living of the men. In some districts they are apt to be very much more pallid than in others.

556. (*Dr. Greenhow.*) Does that apply to Cornwall particularly?—No; to mining districts generally.

557. (*Mr. Austin Bruce.*) In what part of the country do you think that the miners are healthiest?—I think that perhaps some of our Derbyshire and Yorkshire lead miners are among the healthiest.

558. To what do you attribute that superiority?—I think that there must be various causes. It is partly, no doubt, that the mines are very shallow.

559. And the ventilation will be better?—The ventilation would be very bad in many of them, but for the accident of their meeting with fissures frequently which admit air. That is so notorious a fact, that in speaking of driving in a certain direction, when the question is put, "What have you cut; have you cut a lode?" the reply is, "No, sir, we have cut wind."

560. (*Dr. Greenhow.*) Does that apply to the lead mines?—Yes; there are only lead mines in those districts.

561. To what lead-mining districts do you refer as those in which the miners are healthy?—To Swaledale.

562. To Reeth?—Yes.

563. (*Mr. Austin Bruce.*) Are they also better fed?—I think it probable that they feed better than some of the southern men. I should myself think it not unlikely, always remembering that I do not speak as a medical man. I think it not unlikely that the habit of the Cornish miners, to eat a great deal of salt fish, may act prejudicially upon the system.

564. (*Dr. Greenhow.*) Do you think, from your observation, that the miners of Reeth contrast favourably with the Cornish miners?—I think they do as to healthy appearance, especially as compared with the men working in the deep mines of Cornwall. I might pick out plenty of men working in shallow mines in Cornwall who look very well.

565. Are you well acquainted with the mines surrounding Reeth?—I visit them annually.

566. Do you know Hurst, which is about four miles from Reeth?—I know that there is a village of that name, but I do not know the village.

567. You do not know the miners there?—No.

568. (*Mr. St. Aubyn.*) Your observations, you say, are confined to appearances; you do not refer to special observations as to the duration of life?—No. One cannot help feeling that a great number of the

men with whom one converses, or goes underground, in the shape of the agents, are extremely liable at a comparatively early age to an affection of the lungs, asthma.

569. (*Chairman.*) In Cornwall?—Not only in Cornwall, but in Hungary, and in the Hartz, and in Saxony.

570. (*Mr. Austin Bruce.*) In every deep mine?—In every deep mine.

571. (*Chairman.*) In these foreign mines, is there, generally speaking, any machinery for ascending or descending?—In about 1838, they introduced a machine called a "fahr-kunst," which, almost under a precisely similar form, was introduced three or four years afterwards in this country, and known as the man engine. On the Continent, the machines have been far more widely introduced than in England. They have been constructed in a cheap form, and it has been found advisable to introduce them, not only in a great number of metallic mines, but also in a great number of collieries.

572. (*Mr. Austin Bruce.*) Are they to save labour, as well as for security?—Scarcely for security, because of all means of travelling up and down, it has, I think, been proved statistically that properly constructed ladders are the safest as regards loss of life or accident; but it is to guard against the premature working out of the men, and also to save the time and strength which the men expended upon the ladders.

573. Are accidents numerous in these mines, such as the falling of the roof, and so on?—They are not very frequent. Accidents from explosions from premature blasts used to be very frequent; but they have been very much less so of late years.

573 *a.* I suppose they use trams under ground?—Yes.

574. Are there many accidents from the trams?—Very few of that nature. A great number of men, in spite of the use of the safety fuse now so general, get blinded and injured in various ways from premature explosions; but many of those accidents may be traced to the over anxiety of the men to see the effect of a blast, or to the fact that a blast has hung fire, and also to the somewhat ill-advised system adopted by the men of boring out a hole when it has missed fire, which is strictly and absolutely forbidden in some of the continental mines.

575. (*Chairman.*) You say that they have a cheap form abroad for the man-engines. What is the expense generally of a man-engine in itself?—That depends, in the first place, upon the depth, and in the next place, upon the arrangements to work it. You may, in some cases, have to erect a steam-engine especially for the purpose, and in other cases a water-wheel; but the expenses of the actual engine, that is to say, the rod and steps upon it, I suppose may be put at something like 2,000*l.* to 2,400*l.* for the machines which have been erected in Great Britain, and which have generally been to a depth of about 200 fathoms.

576. (*Mr. Austin Bruce.*) What is the annual cost of maintaining them?—I am not prepared to answer that question, because it must depend so much upon the nature of the machine which is required to work the engine; but there are one or two interesting facts respecting it. Hitherto a very small number of these machines have been erected in Cornwall; but last summer, hearing that one had just been completed at a deep tin mine, called Wheal Reeth, in the western part of the county, I went across to look at it, and the agents were so proud of it that they inveigled me into the mine to see all the arrangements which had been made, and I found that this engine also was put down to a depth of about 200 fathoms, and that the monthly cost was, if I recollect rightly, only about 30*l.*; and they stated, that already since it had been put up, during only a couple of months, they found that, in the bottom of the mine, eight men did the work for which they before required twelve.

577. (*Chairman.*) Because they took so much shorter a time?—Because they got fresh to their work; that was the result of these machines being erected.

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578. Is there a difficulty in putting a man-engine, owing to the tortuous nature of the shafts, or could those engines be put in all instances?—The shafts would very often require special cutting down for the purpose to suit them, if the shafts were bad; but very commonly, at the large mines, there is some shaft or other which would be suitable for the purpose.

579. So that the expense is the principal difficulty in having these engines applied?—The expense is, undoubtedly, the great source of difficulty, and further, the fact that the adventurers in a great many of the Cornish mines are people who live in London, and only care about the price of shares, and do not care anything about the convenience of the men.

580. Amongst the men, is there any prejudice against those engines?—The prejudice is very soon overcome. I believe that it has been generally found, that in the course of a few days the prejudice is entirely done away with.

581. (*Mr. Kendall.*) And when the prejudice is once done away with, will the men go back to the old ladders?—Never.

582. (*Chairman.*) So that you would recommend that these machines should be generally applied to mines?—I have very great faith in the numerous advantages resulting from them.

583. In the man-engine is there a provision for safety in case of anything breaking?—Yes; there are catches at intervals to prevent any fall for more than a certain extent.

584. (*Mr. Austin Bruce.*) I suppose the less exhausted a man is at his arrival at the open air, the less likely he is to take cold?—I think that must be the case.

585. (*Chairman.*) You say that the men take off their clothes to work; do they leave their clothes at the top of the mine?—No; they travel in their clothes to their working place, and then put them in some tolerably dry place near.

586. Is there any mine with which you are connected, in which there is a place at the top of the mine where the men change their clothes, or put on dry clothes?—Yes; in all the larger mines there is what they term a "dry" for that purpose, where they have a tube through which hot air is passed; and, when the clothes are very wet, they can generally place them upon it, or suspend them in this place. In the smaller mines they very often turn the boiler house into a place of the kind.

587. (*Mr. Austin Bruce.*) Those are the clothes which they have been working in?—Yes.

578. They have other clothes to walk home in?—Invariably; that is to say, the whole of the Cornish miners do so; but it is done in scarcely any other district; the metalliferous miners in other districts almost invariably wear the same clothes at home as they work in.

589. (*Chairman.*) Do they change their clothes completely in the Cornish mines?—Yes.

590. You would consider that very conducive to health?—I think it must be.

591. (*Mr. Kendall.*) Do you not think that nine-tenths of the miners have dry clothes every morning when they go underground?—Certainly.

592. Although they know that they will get wet within five minutes, they think it essential that they should have dry clothes?—Yes; it is invariably the case, even with a man going to his work at the bottom of a wet shaft, from what I have seen.

593. I gather from you that, generally speaking, the ventilation is very good in the Duchy and Crown mines?—Certainly.

594. In the mines with which you are connected, what per-centage of men work at all in bad air where they have not any artificial means of ventilation; is it anything like 5 per cent.?—I should say that there are perhaps from 5 to 10 out of 100 men who are working in more or less close ends.

595. Generally speaking, are those close ends pre-

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judicial to health?—No, I think not. They are slightly prejudicial undoubtedly, just in the same manner as mining must be considered generally more or less dangerous.

596. Do you think that those mines with which you are connected are better worked than the generality of the large mines in Cornwall?—No, I cannot say that they are.

597. In the large mines in Cornwall do you think that there are very few men prejudicially exposed to these close ends?—Very few, I am convinced of it, having travelled through so many of them, and I have very frequently asked to be taken into a bad end to see what it is like.

598. Generally speaking, though it is very desirable to have large levels high and wide, and in some mines even to enlarge them, yet, generally speaking, do not the levels depend upon the size of the lodes? —Almost invariably; and therefore I would add that the ventilation must partly depend upon the character of the lode itself. The Laxey mine, in the Isle of Man, is a remarkable case, where the lode is, generally speaking, very large, where the ground stands without any timber, and where, therefore, all the excavations may be made large. The mean temperature of the Isle of Man is about 48°. I go there upon a summer's day at 9 in the morning to go under ground; the temperature at the surface or at grass there in the shade is 67°. I go down the shaft to the 100 fathoms level, and I there find it 65°, 2° less than at the surface. At the 190 fathoms level, the shaft being above 200 fathoms deep, it was only 68° on that day, and I have found it as little as 66°, when there was fresh air blowing.

599. (*Dr. Greenhow.*) What is the ore extracted from that mine?—Lead, zinc blende, and copper ore.

600. (*Mr. Kendall.*) In some of the German and Saxon mines is it not the fact that they will have levels kept of a certain size irrespective of the size the lode?—Yes.

601. And irrespective of whether the ground be hard or soft?—They never allow them to be anything less than 2 feet 6 to 3 feet.

602. (*Mr. Austin Bruce.*) When you say "they "never allow them," who do you mean?—The authorities.

603. (*Mr. Kendall.*) It is under Government inspection?—Yes; it is under more than an ordinary inspection, because it is under the superintendence, one might say, of Government officials, inasmuch as Government jurors set the ground to the men.

604. Moreover, if there is any particular twist, as happens sometimes with the veins in Cornwall, they will go straight on in order to keep ventilation; is not that sometimes the case?—No, I think not; not in Saxony

605. But they go to a very great expense?—They go to a very heavy expense, because they look upon it that the mines are intended to last for centuries.

606. Although it may be very desirable, as far as ventilation goes, could that system be at all introduced in the Cornish mines?—No; I think that it would be very questionable.

607. It would stop many mines?—Undoubtedly; if you had to break dead ground to no purpose.

608. You have spoken of the expense of driving. From your recollection will you give us an idea of any particular sudden change of price within 6 or 12 feet, in order to give an idea of the variation of prices?—I do not know that I can give a case of a sudden change of that kind, although I have seen a great number, but not where the price has been so suddenly varied. Of course getting into a cross-course the price may go down from 15*l.* a fathom to 30*s.* in the course of a foot or two. Cases of that sort very frequently occur in certain levels where they are subject to changes of ground coming in with great rapidity.

609. In the working of foreign mines do you think that the miners are as practical as they are in some of the mines in England?—Quite so in the better districts; in such districts as Saxony and the Hartz. In fact, the Austrian miners of Hungary, I think, were the first to lead the way in the efficient ventilation of mines and the driving of large levels. It was notorious at the beginning of this century, that they drove larger levels than anybody else.

610. (*Mr. Austin Bruce.*) Do they follow any peculiar system of ventilation?—No; it is very similar to that of the Cornish mines.

611. Then in what consisted their originality?—In commencing to drive larger levels; giving more space to the air, in fact, and less friction.

612. (*Mr. Kendall.*) Have you been in any of the old levels, what are called the workings of the old men?—Frequently.

613. How narrow have you ever found them?—Three feet by 14 or 15 inches. One has been obliged to walk double. In the shallow workings of the Par Consols there are some of those levels

614. (*Mr. Austin Bruce.*) Are there any such workings now?—The nearest approach that I know are some very confined little levels which are driven in the Yorkshire mines under the name of dark drifts.

615. What is the state of health of the miners there?—That is the district of which I spoke when I said that they occasionally cut wind.

616. They have natural ventilation?—Yes; but otherwise they would be very badly off.

617. (*Dr. Greenhow.*) You consider that the lead miners are healthier than the Cornish miners; does that apply to the lead miners generally, or only to those in Swaledale?—I intended that only to apply to the men who were working in very shallow mines; and most of them have a little bit of land, and work upon it a good portion of their time.

618. Are you acquainted with the Alston Moor mines?—Very well.

619. What is the state of the miners there?—For a good many years I had a little mine there myself, and I know Mr. Beaumont's mines.

620. But they are at Allenheads?—Yes. I should say that those men are not a thoroughly healthy class of men; they are a peculiar class,—tall, slim men; but generally speaking they are of a pallid complexion, and I have observed at our own place that when a shepherd comes in off the fells to take refuge from the bad weather and to get his supper in a miner's hut, he will eat at a meal as much as four or five of the miners will eat; their appetite, generally speaking, being so much smaller.

621. Would the Alston Moor miners contrast unfavourably with the coal miners, as far as their health goes?—No; I would not say unfavourably. The same effects to a considerable extent seem to act upon them, although they have not to travel great depths.

622. Do you consider the great depth of the mines to be the reason why the Cornish miners suffer so much from asthma?—I should think that that was probably the chief reason. I can judge of it by my own feelings after descending the very deep mines. After a work of that sort one feels a considerable degree of lassitude.

623. Do the Alston Moor miners suffer from asthma?—I believe not to any great extent. I only judge from what I have seen of the men working in full vigour. But there is a special reason with respect to many of the mines in that district, namely, that if men do not suffer there through climbing from great depths, they suffer from another cause, namely, the bad ventilation consequent upon driving excessively long levels. Instead of sinking shafts great depths they drive levels from valleys sometimes to a distance of a mile or a mile and a half into the hill sides, and have to go without any ventilation very great distances. Then they cut a lode, and open out a series of workings; and the ventilation in some of those workings, I should say, from my experience, is far from satisfactory.

624. That is at Alston Moor?—That is at Alston Moor and Allen Heads, and the whole of that district.

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I have, in a particular mine there, found that on a summer's day the men were all driven away from their work by carbonic acid.

625. Whence did that carbonic acid come?—It might be from various causes. I cannot state confidently, but there are undoubtedly cases in which it emanates from the rock.

626. Were the levels in the mine you speak of driven through rock or shale, or plate as they call it in that district?—They had both.

627. Do you think that the carbonic acid was given off from the shale?—I think it extremely likely; for one knows that in some districts it is distinctly given given off from shale as well as fire-damp.

628. Do you think that the condition of the external atmosphere modifies the condition of the internal atmosphere as regards carbonic acid gas; that is to say, that in certain states of atmospheric pressure there is more carbonic acid gas in the atmosphere of the lead mines of Alston Moor than at other times?—I think that there is no doubt of it; and, moreover, that the varying state of atmosphere will throw the ventilation into a very different condition, and sometimes tend to check it, and at other times to increase its strength.

629. Are there any ventilating shafts in the Alston Moor mines?—There are.

630. Are you acquainted with the distance of those shafts from each other; there is no rule, I suppose?—There is no rule.

631. You have spoken of fissures, or shakes as they are called; are there any shakes in the Alston Moor mines?—There are in the bed of limestone which they call the Great Limestone, in which many of the mines are principally worked,—one particular bed of the limestone.

632. Are there any shakes in the mines at Reeth?—They are very frequent indeed. I have visited Grinton Moor and Whitaside and one or two of the mines in Wensleydale, and they all of them have shakes occurring very frequently in the thicker beds of limestone.

633. Do you know the mines near Pateley Bridge?—I have never visited them.

634. You have spoken of miners being asthmatical; do you know the age at which they become affected in that way, giving merely your general impression?—I think that I have seldom seen a man under 45 decidedly asthmatical.

635. But do you meet with many men over 50 who are not asthmatical?—Yes, plenty.

636. Both in Cornwall and in the lead mines?—Yes.

637. Do the Cornish miners continue to work at an advanced age?—Yes. I have mentioned the case of a man of 66 working in the hottest end in Levant Mine. I had the curiosity to enquire of him respecting his own family, and I found that his brother had worked there till the age of 70; but those are certainly somewhat unusual cases; one does not generally find men of more than 50 or 60 working under ground.

638. And not many at 60?—Not many at 60.

639. (*Mr. Kendall.*) Taking the general rule, are they used up at 40?—I cannot think that they are.

640. (*Chairman.*) You refer to Cornwall?—Yes. I cannot think that they are in either case.

641. (*Dr. Greenhow.*) Are the lead miners often used up at 40 or 45?—I have not seen sufficient of the lead miners to judge whether they are used up then; it is not rare that they prefer then to turn to cultivating a farm, or something of that kind.

642. Are miners, after becoming incapacitated for working in the mines, often able to work at grass as they call it?—Very frequently for many years.

643. Those who cannot continue to work below can do light work under other circumstances for many years?—Yes; the dressing works employ a great many men of that description.

644. The men who are employed there are, commonly speaking, old miners unable to work the lodes, are they not?—Yes; and many of those men are employed in the shallow workings, where is there better ventilation and less fatigue.

645. Do you think that in your experience shallow mines are generally better ventilated than deep mines?—They generally are so; but you must remember that there is an element which would lead one, perhaps, to mistake,—in the higher temperature of the deep mines.

646. Which element favours ventilation of course?—Which element favours ventilation, but at the same time makes a close end so very oppressive that a person going into it may fancy that the ventilation is really worse than that of a shallow mine, where the air may be very deficient.

647. In speaking of the Botallack mine, you spoke, as I understood you, of a connexion which they had got between the far end and the surface; did you say that there was only one shaft?—Yes; I was there speaking of Wheal Cock.

648. Are there any means used to ensure the passing of fresh air down that shaft, and the passing up of the exhausted air?—No; the air contrives to find its way down and up as it can; but we are always in hopes that we shall have a cross-cut driven.

649. (*Mr. St. Aubyn.*) I think you say that that is an exceptional mine, and that the ventilation is bad?—Yes. In fact, in mines as deep as that, such as the Holmbush mine in the eastern part of the county, I have sometimes found the ventilation so violent all through the mine, that I have been obliged to run from one level to another with my note-book in my hand, unable to get a still place to sit down in until I could get behind a door.

650. (*Dr. Greenhow.*) Is there much dust in the atmosphere of the Cornish mines?—Not generally; but some lodes are very apt to produce dust as compared with others, especially if the place is dry.

651. In those cases, does the dust hang in the atmosphere for a considerable time after an explosion?—Certainly, if the ventilation is bad.

652. I suppose that all these metalliferous mines are worked by blasting with gunpowder?—Almost invariably.

653. How long do you think that the gunpowder smoke, as a rule, hangs in the atmosphere of a mine after explosion?—As a rule one may say that it is got rid of in an end in something like half an hour; it then begins to find its way through the workings. It may incommode one in travelling through the workings, but still it is got rid of.

654. Do the men often return to work before the smoke has passed away?—Very often.

655. Habitually?—Generally before it is entirely cleared away; and sometimes if they are particularly anxious to see what is the result, they will go back when it is so thick that you cannot see your hand before your face.

656. In some mines will the smoke very often hang longer than half an hour?—In very few cases I think.

657. Is there any provision that the shots shall be fired at a time when the men are about to go off work, there being two cores in a day?—That is usually the case; it is the case where any great number of men are employed together; they generally prepare their holes more or less at the same time, so as to fire off a complete battery before they leave.

658. Still they are firing more or less all day long?—Yes.

659. You spoke of carbonic acid gas being given off from the strata in some mines; is that the case in Cornwall as well as in the lead mines?—I think not. I have occasionally been in a mine where there has been great difficulty in getting a candle to burn, but I never, except at Pontgibuad, saw a case in which the effect could be distinctly traced to carbonic acid.

660. (*Mr. Davey.*) Is not that when the lode is rich in mineral?—I think that when the lode is rich in mineral, you have a great amount of decomposition going on, and it will become oxidised from the atmo-

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sphere, and in that case you get an accumulation of carbonic acid.

661. (*Dr. Greenhow.*) Does that apply to copper mines ?—Chiefly.

662. In tin mines the oxygen is not exhausted ?—No.

663. The ore is already perfectly oxidised ?—Yes; and there is no tendency to decomposition.

664. But decomposition is going forward in the copper mines ?—Yes ; and it depends also, generally speaking, on the nature of the ground as well as of the lode.

665. (*Mr. Davey.*) Do you think that that is the reason why tin mines are less unhealthy than copper mines ?—I think so.

666. You have stated that you felt very much oppressed in one of the levels at Botallack at a temperature of 84° ?—Yes.

667. Did you find that the men themselves felt as much oppressed ?—No. The men working in that rise stand upon a stutt or cross piece of timber, and in conversation with one of the men he told me that he preferred working in that temperature.

668. They work in those hot places for some time? —Yes.

669. They do not suffer so much as fresh men coming in ?—No. Speaking from my experience in the deep mines, I find that the men work with tolerable vigour, and that they decline to work in any cold places as long as they could get to these warmer ones.

670. After being accustomed to them ? — After being accustomed to them.

671. (*Mr. Kendall.*) Did you ever weigh yourself before going down a mine and on coming up ?—No.

672. Have you ever met with a case of that kind ? —I have frequently been told of an example of that kind.

673. What is the greatest loss that you have ever heard in the case of a man after a descent of three or four hours ?—At the Great Consols some 18 years ago, when they were down 320 fathoms, I recollect the agents telling me of their weighing a man a day or two before I was there, and finding that he lost, I think, eight pounds. I went to the bottom of that mine where it was very hot, and it was in consequence of remarks upon the heat that the agents told me of that case.

674. (*Dr. Greenhow.*) Have you made any analysis of the air in mines ?—No.

675. (*Mr. Kendall.*) I asked Mr. Hunt whether he thought that he could carry the ventilation much further in one locality than in another, and he said that he rather thought not. But from what I have gathered from you to-day, taking the workings in the Levant Mine and elsewhere, the chances are, that taking precisely the same working in another mine in another district, you could not depend upon the same ventilation there as in the Levant Mine ?—I should say without any hesitation that you could not.

676. (*Mr. Davey.*) You have stated that the atmosphere at the surface very materially affects the ventilation below ground ?—It does.

677. When you got a heavy or a muggy day at the surface you get the ventilation below very bad ? —Yes ; and I may state in addition, that some mines have very great advantage in having certain openings facing the prevalent wind, and that when a gale of wind is blowing, they feel it down to the 100 or 150 fathoms level, through all the principal workings.

678. (*Mr. Austin Bruce.*) Will you state your opinion as to the relative ventilation in the best managed foreign mines, and in Cornwall ? — I think that, taking them as a class, I cannot state that there is any difference.

679. Are the best managed mines abroad inspected by Government or not ?—Almost invariably.

680. Do you believe that in those mines every precaution is taken which human ingenuity can suggest to diminish the inherent bad effects upon health and life in mines ?—Yes ; I believe that it is so in those districts to which I have specially referred.

681. Do you think that, as a general rule, anything could be done in the Cornish mines to diminish the evil effect of underground working upon health ?—I think that a more general adoption of the so-called man engine would be a very excellent measure.

682. (*Chairman.*) You stated that there were several advantages connected with the man engine ? —I did.

683. Can you state to the Commissioners what are the different advantages of that engine, besides the saving of the time and the labour of the men in going down and coming up ?—It operates as a prevention of their premature wearing out ; a prevention, to a great extent, of diseases of the lungs and heart, in addition to motives of economy in time.

684. Which premature wearing out, you think, is occasioned in some degree by having to mount the ladders ?—I think so in the deeper mines.

685. You consider that it would be economy in working, in every point of view, to have a man engine ?—I think so, wherever the mine is more than 150 fathoms deep, and where a large proportion of the men have to work at that depth ; because it must be remembered, that in the metallic mines the men are working at various depths, all the way down. In Westphalia, where they have lately been erecting several of these man engines, and with a great degree of perfection, apparently, judging from the accounts, they seem to consider that it pays to put up a man engine where there are several hundred men to travel, even where the depth is not more than 100 fathoms.

686. Can the same machinery be used for raising the mineral ?—It may be used by the application of very complicated machinery.

687. Is there any reason why it should not be used if properly combined ? — I think that there is no occasion to attempt that.

688. (*Mr. Austin Bruce.*) You are, on the whole, clearly of opinion that the general adoption of a man engine would be favourable to health and length of life ?—I think there cannot be a doubt about it.

689. Could you recommend the adoption of any general system in respect to the size of the levels ?— I do not think that it is possible to lay down any general rule, because, in the first place, levels are driven with such various objects, and in the second place the character of the ground differs so very much.

690. It is very generally a question of economy ? —It must be so, more or less.

691. Do you believe, for instance, that if you had the absolute power of ordering the works necessary in your opinion for the health of the miners in the mines of the Duchy of Cornwall, you could add materially to the healthiness and length of life of the miners ?—Not very materially, I think. I must say that the greater part of the agents who conduct mines which I have to visit have their eyes quite open to the necessity of driving large levels, and getting plenty of air to pass through them. There are some agents who are not so well acquainted with the principles of ventilation as one would wish to see, and sometimes they are apt to point out to one, as a proof of their good ventilation, the very place which is a proof of bad ventilation ; that is to say, a proof that they are throttling the air, and giving it too much friction.

692. How are the mistakes of such men remedied? — Generally speaking they remedy themselves in the course of the working, when some of these levels get abandoned after a time, and others are opened. It must be remembered that most of them are temporary.

693. You are acquainted, I dare say, with many colliery districts as well as with the metallic mine districts ? — Yes, a good many.

694. You know that there is a very great difference between the completeness of ventilation in some collieries and in others ? — Very great.

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695. That men with small capital are very apt to provide defective ventilation ?—Yes.

696. Have you the same sort of difference in the mines in Cornwall ?—No ; I think that as regards the Cornish mines, their dependence upon natural ventilation renders that difference almost nil, inasmuch as all the workings are sure to get ventilated, with some exceptional cases, tolerably satisfactorily.

697. There the want of capital would be felt in the smallness of the levels, and occasionally in having one shaft instead of two ?—In the early conditions of a trial, undoubtedly the opening of the ground with one shaft may lead to a very insufficient ventilation for a time ; but one must remember that a trial of that kind generally involves the working of a very small number of men ; generally speaking, perhaps, only two men in an end, or two men in each end,—four men altogether at the same time,—so that a very small quantity of air, such as would be carried down a small pipe, may be quite sufficient for the purpose.

698. I presume that a man careful of the health of his miners would often drive a larger level than was absolutely necessary for getting out the mineral ?—I think that it is the case with many of the more intelligent agents at present, that they have a tendency to drive their levels over-large, rather than to drive them over-small. That is especially in cross-cuts.

699. Have you visited other mines than those of the duchy of Cornwall ?—A great number.

700. Did it ever happen to you that, in the interest of the miners, you would yourself have ordered, if you had had the power to do so, larger levels than those which you found in existence ?—Sometimes that would be so, but not generally speaking, taking levels which have been driven within the last twenty or thirty years.

701. Then, on the whole, you consider the working and ventilation of the Cornish mines generally satisfactory ?—They are, taking them as a whole.

702. (*Dr. Greenhow.*) Does the health of the men vary in different mines ? Do you find in Cornwall that men belonging to certain mines break down earlier than those belonging to other mines ?—I have not sufficient acquaintance with the statistics of the workmen to be able to answer that question definitely.

703. (*Mr. Kendall.*) You stated very properly that it would be very desirable to have these levels three feet or three feet and a half wide. Supposing that a lode, which is very frequently not more than two feet wide, has been driven through hard granite, which is very often the case, what would be the cost per fathom, to take down a foot through what would be perfectly unprofitable rock ?—When you have once got a hole through to a certain point, a pound or two per fathom or something of that kind would, generally speaking, open it out sufficiently largely.

704. (*Chairman.*) Do you state that from any experience ?—Generally ; from cases which I have seen. I do not say that driving a level of a large size to commence with would only make that difference, but when you have got it driven through, the taking down a fathom at the side would merely involve putting in a few shots.

705. (*Mr. Austin Bruce.*) That, of course, would depend upon the nature of the rock ?—Entirely.

706. There are some grits which are very hard ?—There are some grits and some granites, which may be so extremely tight and free from any joints, that it is excessively expensive to break them down.

707. (*Mr. Kendall.*) With respect to Goverment inspection, have you been much in the French mines ?—I have only visited the Pont Gibaud metallic mines.

708. Are you aware whether the inspection in France is severe or not ?—I have heard that it is rather troublesome.

709. And that the mines might be managed better without it ?—I think so. They are very particular with respect to the health of the men ; but I think that they interfere overmuch, and with minutiæ which they had better avoid.

710. (*Dr. Greenhow.*) Are the French miners more healthy than ours ?—No, I cannot say that they are ; but they suffer from a very large evolution of carbonic acid, in such large quantities that it blows the candle out completely.

711. Is much dust given off in boring the shot-holes in the Cornish mines ?—Only in some few cases and in very dry working places ; they, generally speaking, carry down water specially for the purpose of obviating that inconvenience, to keep the bore-hole full of water.

712. You are acquainted with the lead mines ; is the same process of putting water into the holes adopted there ?—Very commonly ; but in the lead mines, generally speaking, they have not the disadvantage of boring through gritty or quartzose material, nor through substances containing arsenic, as they do in some of the tin and copper mines.

713. Is much arsenical dust given off in the Cornish mines ?—In the tin lodes very commonly, and in many of the copper lodes.

714. Do the miners suffer very much from that ?—I question whether they do.

715. Have you not seen many miners suffer ?—Yes ; but I am doubtful whether it could be traced distinctly to that cause ; at the same time one can smell, in some of the ends and pitches, most readily, that arsenic is being given off.

716. (*Chairman.*) Do the captains give any regulations to the men as to the use of the fuses ; are there any regulations in a mine ?—Sometimes ; I think the regulations are, generally speaking, only understood.

717. Are there any printed regulations which are given to the men ?—In some mines there are printed regulations too; but they seldom go in to those minutiæ.

718. (*Mr. Davey.*) Some are printed on a board and others on paper ?—Yes, that is very commonly the case ; but I think that they seldom go into the minutiæ of the way in which they shall fire.

719. (*Chairman.*) In the mines of the Duchy of Cornwall no strict regulations are laid down ?—Not otherwise than in the other Cornish mines, because the management is vested in the agents of the lessees.

The witness withdrew.

Adjourned.

NEWCASTLE.

Tuesday, December 15th, 1863.

PRESENT :

The Right Honourable Lord KINNAIRD.
Sir P. GREY EGERTON, Bart., M.P.
NICHOLAS KENDALL, Esq., M.P.
RICHARD DAVEY, Esq., M.P.
P. H. HOLLAND, Esq.

The Right Honourable Lord KINNAIRD in the Chair.

NEWCASTLE.

Mr. T. E. Forster.

15 Dec. 1863

Mr. THOMAS EMERSON FORSTER, Mining Engineer, of Newcastle-upon-Tyne, called in and examined.

22,572. (*Chairman.*) I believe you are a mining engineer ?—I am.

22,573. And also manager and viewer to several collieries ?—I am.

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22,574 Have you been employed as engineer for many years ?—Upwards of 40 years, my lord.

22,575. Have you had considerable experience of the working of collieries ?—Well, I have had a good deal of experience.

22,576. Your experience is confined to collieries ?—Well, collieries, lead mines, and ironstone mines. I have inspected all these.

22,577. Those lead and ironstone mines that you have inspected, are they in the north ?—Entirely in the north.

22,578. At present what number of mines have you principally the management of ?—I have the entire management of Seaton Delaval Colliery ; I am consulting viewer to the South Hetton Coal Company, the Haswell Company, and Lord Durham ; and I am also advising viewer to My Lord Lonsdale at Whitehaven, and several more little places ; and I am also lessors' viewer for a great many places ; that is what we call in this district check viewer for the lord of the royalty.

22,579. Will you tell me about the number of men employed at Seaton Delaval ?—Of men and boys we have upwards of 700 that go down the pit every day.

22,580. And what means have they of ascent and descent ?—The ascent and descent is entirely by cages.

22,581. Have the cages been in operation ever since the mine was opened ?—Yes.

22,582. How many years will that be ?—The mine has been opened altogether about 21 or 22 years.

22,583. How long have you had special charge of it ?—I have had charge of it for 17 years gone last July.

22,584. And during that time the cages have always been at work ?—Always been at work.

22,585. Is there any difficulty in taking that number of men up and down ?—Not the least.

22,586. What hours do they go up and down in principally ?—The men begin to go down at half-after-two in the morning, the boys at half-after-four. That is what we call the fore shift. The men that go in back go down about half-after-nine, to commence work at ten, and the men and boys all ascend again at five.

22,587. How many men at one time are waiting to be taken down ?—I have seen a couple of hundred waiting.

22,588. How long would you say it would take to send them down ?—About 20 or 25 minutes, 12 at a time.

22,589. You have no difficulty then as to time in getting the men up and down ?—Not the slightest. I may just explain that we have a very good plan which was adopted I believe at my son's colliery first of all. There was a great deal of crushing ; the men would not wait for their turns, and there was a great deal of crushing to get into the cages, and we adopted a rule that there should be tokens, little strings with number 1, 2, 3, and so on, upon them, up to 12 ; and as the first men came on to the heap to go down, they took number 1 ; when they got to the shaft they presented number 1 to the banksman, and he allowed the twelve that held number 1 to get into the cage. Since that plan was adopted we have not had the slightest difficulty. They now keep their turns ; before they crushed in.

22,590. (*Mr. Kendall.*) In coming up is the same principle in operation ?—Yes.

22,591. The man who leaves work first gets number 1 ?—Yes. But except at nights when the boys and men all have to come up together, there is no great crush at the bottom. At night, when all ascend, the men have to take their number, but there is a rule that one cage is entirely set aside for the boys to come up at once, or else the men would keep them back, and the boys would not get up till the last.

22,592. (*Chairman.*) During the time that you have had the management of this colliery what accidents have you had ?—We have never had one accident at all.

22,593. You have never had one accident connected with the cages ?—Not one during 17 years connected with the cages.

22,594. So that you consider it a very safe mode of taking men up and down ?—It is the safest mode. If we had to go back to the old plan of putting the leg into a loop and going down that way, we would have a strike immediately. The men would not do it. They durst not do it.

22,595. Had you ever ladders ?—No ; we have ladders in short staples.

22,596. What was the old mode of descent ?—The old mode of descent was this : the chain was hooked up and two men got in, one with the left leg and the other with the right, and they went down that way. In the second loop, above the other, were two men in the same way ; and the little boys used to get on to the rope, with their arms and legs round about it.

22,597. (*Mr. Kendall.*) They sprang on to the rope ?—Yes.

22,598. (*Chairman.*) How many ever went down with the same rope ?—I have seen ten little boys and four men going down at the same time ; and when I was a little fellow myself I used to like to get on to the rope and go down that way myself. It was much easier than your thigh getting nipped in the chain.

22,599. But regular ladders were never in use ?—Ladders were never used in pits, except within the pits for staples of short depths, of from 15 to 16 fathoms.

22,600. Have you any experience of what accidents happened during the old time ?—Oh, yes ; frequently during the old plan men have fallen out from the loops and boys have fallen off in going down. I recollect one very well, it happened when I had the management of Hetton colliery. There was a man ascending, and what was the cause of the accident we could not tell ; but he fell out. He was coming up by himself. He fell out and was killed.

22,601. They were hempen ropes at that time ?—Yes.

22,602. When cages were first introduced, were they worked with hempen ropes or chains ?—Entirely by hempen ropes ; and I may just tell you that cages have been in this district for 30 years. The first pit that was fit up with them was a little place west of Newcastle called Townley Main. I came up to see it. I was then sinking a pit called Belmont for Mr. Bell and Mr. Backhouse, and I recommended cages to be put in there, and they were put in. That was upon the Wear at Belmont, and then everybody began to use them. We had hundreds of people at the week's end coming to see those cages, and of engineers and viewers coming to take measurements, and it was entirely adopted from that time.

22,603. Were these worked with all hempen ropes or with chains ?—With hempen ropes with chains at the end,—short chains at the end.

22,604. When were wire ropes first adopted ?—Wire ropes were first adopted about 1843, 20 years ago.

22,605. Did they come into very general use then ?—Not very quickly. In 1843 they began, and in 1844 the pitmen were in a very disturbed state, and they struck at a colliery called Wingate Grange, because they considered the wire rope was not safe ; and they brought an action against their employers, and it was tried at the summer assizes in 1844, and of course they lost the trial, for there were experiments made of the strength which the ropes would bear, and it was given against them.

22,606. So that many of the men had a great prejudice against the wire rope when it was first introduced ?—Yes. At that time I had the management of a little colliery called the Felling, and I had round hempen ropes on, but I was anxious to try the wire rope, and I put on one wire rope and one hempen rope ; and after the men struck at Wingate Grange, my men at the Felling soon found the wire rope was not safe. So when I was over, my under viewer told me what the men had said, that the rope was not safe, and I went to the pit and gave positive orders that none of the men were to ride upon the wire rope, but that they were all to ascend and descend upon the hempen rope. They went on in that way for two days, and then they said, "Oh, its just as safe as the hempen rope," and away they went. I always made it a point myself when I went to the colliery to go down and come up upon the wire rope. I always did that myself, and they soon found out it was as safe as the other; but if I had insisted upon them using it, there would have been a strike immediately.

22,607. At the Felling, was it a round wire rope or a flat rope?—In the first instance the rope was a round wire rope that we used, but not altogether. I used it at the Felling because the pit was not very deep, but at Wingate Grange it was a flat wire rope.

22,608. Have you continued to use the flat wire rope?—I have never used anything else since then. We have had flat ropes at Seaton Delaval, in the old colliery.

22,609. Then it is your opinion that flat wire rope is preferable to round wire rope?—I don't know that. I would not like to say that. I think it entirely depends on the depth and the load you have to bring up. I prefer myself the flat wire rope.

22,610. In your experience, what length of time ought a flat wire rope to last?—It depends entirely upon the quantity of coals drawn. I could give you an instance. At Seaton Delaval we have had the wire ropes on for two years, and we have had flat hempen ropes on for two years; but then the wire rope is so much lighter than the hempen rope, that it is a great advantage to the machinery.

22,611. And what quantity do you draw generally on an average per day?—At present we are drawing 1,000 tons a day by one pair of flat wire ropes.

22,612. And what depth?—119 fathoms.

22,613. And without any apparent wear and tear they have lasted one year?—No.

22,614. How long have the ropes been used before you consider they require to be renewed?—The last pair of ropes we had on Seaton Delaval lasted thirteen months, but they drew a tremendous large quantity. They drew 300,000 tons of coals.

22,615. And how did you judge when they required renewing?—We judge from the outside wires breaking occasionally. I dare say they might have gone two or three months longer; but rather than run the risk of a rope breaking I would sacrifice 100*l.*

22,616. Can you tell what was the cost of this wire rope?—Yes. I have all the measurements, I think. The rope was five inches broad, and one inch thick, and 170 fathoms long, and weighed 46 cwt. 2 qrs.; each rope that is. The pair of ropes cost 195*l.* 6*s.* That is for 170 fathoms of rope, each rope.

22,617. When you cease to use the ropes, what do you do with the old ropes?—We sell them. What cost us 195*l.* we have got 16*l.* 19*s.* 1*d.* for last fortnight.

22,618. (*Mr. Kendall.*) Simply as old iron?—Yes. My son makes his into nails, but we don't happen to have an establishment for nailery, and therefore we sell them.

22,619. (*Chairman.*) Then you think a wire rope gives you full notice by the breaking of the wires, when it will become unsafe?—Yes.

22,620. Do you think it gives you more notice than a hempen rope?—I don't know that there would be very much difference. We watch them both, whether it is hemp or wire, very narrowly. They are examined at least three or four times every day.

22,621. But they give much more notice than a chain?—Oh, a chain! I durst not go down upon a chain. I once went down in Scotland upon a chain, but durst not go again.

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22,622. Have you ever worked with a chain?—Never.

22,623. Do you know any instance of a chain breaking?—I don't know of any instance of a chain breaking in this neighbourhood, excepting once, and that was when my under viewer at Shotton colliery and his son were going down, and the link had evidently been broken some time, at least during the morning, for a mason that was working down the pit came up, and as he got out the man and his son got in, and they only went one stroke below the settle boards till the cage dropped, and of course they were killed.

22,624. What will be the difference of cost between a hempen rope and a wire rope?—At present, a hempen rope would be much the dearer. We get wire ropes at present at 42*s.* per cwt., but you could not get a flat hempen rope under 46*s.* or 47*s.* per cwt.

22,625. What would be the difference in weight?—The weight would be I should think at least seven or eight cwt. each rope heavier than the wire rope. The hempen rope would be much heavier than the wire rope.

22,626. And, as you stated before, the hempen rope works at much greater stress upon the engine than the wire rope?—Yes; an engine runs much easier with the wire rope than with the hempen rope.

22,627. (*Mr. Holland.*) You said you gave up the use of the wire ropes as soon as the outsides were beginning to break?—Yes.

22,628. Is that the rule of the trade?—I don't know that. We put the charge of the ropes entirely under the engine wright. He is now called an engineer. The ropes are in his charge, and he has to examine them daily, and if he sees the slightest flaw in them they are to be taken off.

22,629. Are they fairly worn out so soon as that?—Oh no; but rather than have an accident you had better sacrifice a pair of ropes.

22,630. You are, perhaps, very cautious?—I am, in the shafts, particularly.

22,631. I want to know whether it is the rule of the trade or not?—I cannot say for other people. I once tried Froudimer's Patent for stopping cages in the shaft in the case of ropes breaking, but I found we had to watch that instrument far more than we had to watch the ropes, and I gave it up, because if it got wrong and the ropes were bad we might have an accident.

22,632. You spoke of ladders for short staples just now, what do you consider the length of a staple in this county?—20 fathoms would be considered a very long one.

22,633. More than 20 fathoms are rare, are they?—I don't know of one instance of 20 fathoms. I know of one fifteen fathoms at a little colliery not far from here called Wylam.

22,634. (*Chairman.*) Then you do not use safety catches in the mines under your charge?—No, I do not. I prefer watching the ropes to watching these safety catches.

22,635. Is there no fear of the engine over-winding?—It sometimes does happen. Safety catches are in case of the rope breaking in the shaft. Over-winding is when the man gets over the pullies.

22,636. Have you no means, in case of over-winding, of detaching the cage?—No, we have not; I would rather trust to the man that has charge of the engine than to these mechanical contrivances, because, if we had those contrivances the man would be neglecting them. Now he has his whole attention directed to it, and he knows the consequences if he were to overwind.

22,637. You think the introduction of the catch to loosen the cage when it gets overdrawn, would diminish the carefulness?—I think so; it would act upon his mind and he would get careless.

22,638. You think that a man although he knows the catch was an extra precaution in case of accident, would become careless?—He would; he would not pay that attention he does now.

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22,622. Have you ever worked with a chain?—Never.

22,623. Do you know any instance of a chain breaking?—I don't know of any instance of a chain breaking in this neighbourhood, excepting once, and that was when my under viewer at Shotton colliery and his son were going down, and the link had evidently been broken some time, at least during the morning, for a mason that was working down the pit came up, and as he got out the man and his son got in, and they only went one stroke below the settle boards till the cage dropped, and of course they were killed.

22,624. What will be the difference of cost between a hempen rope and a wire rope?—At present, a hempen rope would be much the dearer. We get wire ropes at present at 42*s.* per cwt., but you could not get a flat hempen rope under 46*s.* or 47*s.* per cwt.

22,625. What would be the difference in weight?—The weight would be I should think at least seven or eight cwt. each rope heavier than the wire rope. The hempen rope would be much heavier than the wire rope.

22,626. And, as you stated before, the hempen rope works at much greater stress upon the engine than the wire rope?—Yes; an engine runs much easier with the wire rope than with the hempen rope.

22,627. (*Mr. Holland.*) You said you gave up the use of the wire ropes as soon as the outsides were beginning to break?—Yes.

22,628. Is that the rule of the trade?—I don't know that. We put the charge of the ropes entirely under the engine wright. He is now called an engineer. The ropes are in his charge, and he has to examine them daily, and if he sees the slightest flaw in them they are to be taken off.

22,629. Are they fairly worn out so soon as that?—Oh no; but rather than have an accident you had better sacrifice a pair of ropes.

22,630. You are, perhaps, very cautious?—I am, in the shafts, particularly.

22,631. I want to know whether it is the rule of the trade or not?—I cannot say for other people. I once tried Froudinier's Patent for stopping cages in the shaft in the case of ropes breaking, but I found we had to watch that instrument far more than we had to watch the ropes, and I gave it up, because if it got wrong and the ropes were bad we might have an accident.

22,632. You spoke of ladders for short staples just now, what do you consider the length of a staple in this county?—20 fathoms would be considered a very long one.

22,633. More than 20 fathoms are rare, are they?—I don't know of one instance of 20 fathoms. I know of one fifteen fathoms at a little colliery not far from here called Wylam.

22,634. (*Chairman.*) Then you do not use safety catches in the mines under your charge?—No, I do not. I prefer watching the ropes to watching these safety catches.

22,635. Is there no fear of the engine over-winding?—It sometimes does happen. Safety catches are in case of the rope breaking in the shaft. Over-winding is when the man gets over the pullies.

22,636. Have you no means, in case of over-winding, of detaching the cage?—No, we have not; I would rather trust to the man that has charge of the engine than to these mechanical contrivances, because, if we had those contrivances the man would be neglecting them. Now he has his whole attention directed to it, and he knows the consequences if he were to overwind.

22,637. You think the introduction of the catch to loosen the cage when it gets overdrawn, would diminish the carefulness?—I think so; it would act upon his mind and he would get careless.

22,638. You think that a man although he knows the catch was an extra precaution in case of accident, would become careless?—He would; he would not pay that attention he does now.

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22,714. What is the breaking load ?—90 tons.

22,715. What is the cost of the cage ?—It is not engaged for drawing the men only, it is used for drawing the coals also. If I had a pit that was merely for the sake of drawing the men, I would not care about drawing them so quickly ; I would rather not draw them so quickly ; I would put up a lighter apparatus and run them down in a longer time, that is if the pit was not required for any thing else.

22,716. (*Mr. Kendall.*) Suppose you have got a mine a couple of hundred fathoms deep, and you had to pass down, say 200 men, what would be the cost of the engine that would take these men down in there-quarters of an hour ?—The cost of the engine, I should think, would be 300*l*. or 400*l*. The engine that took you down yesterday cost only 400*l*.

22,717. That is independent of the ropes and cages ?—Yes.

22,718. The engines and boilers ?—No ; without the boilers, just the engine.

22,719. What is the size of the cylinder ?—25 inches cylinder; 40 horse power.

22,720. Can you give an approximate guess at this ; —the cost of the engine, boiler, the rail, and everything necessary to the skip, on your principle, taking it at 200 fathoms, to draw the men alone ?—And to draw them as quickly as we now draw them.

22,721. Pretty nearly as quickly ?—Yes ; I can tell you roughly ; I should think about a 30 horse-engine would be sufficient, and the cost would be about 600*l*. with the boilers, and I suppose you would mean to provide for slanting shaft as well as vertical shaft, cages, and guides. They would cost if they were fit up the way that ours are, about 400*l*. or 500*l*., that is, to fit them up as strongly as ours.

22,722. That is, from 1,000*l*. to 1,200*l*. would complete the whole thing ?—Yes, to fit it up as strongly as ours, but it might be done cheaper if you fitted it up lighter ; I can make a proper estimate.

Estimate (men and material).

Engine - -	£1,800
Guides - - -	500
Cages - - -	60
Ropes - - -	300
	£2,660

22,723. You don't know the cost of a man-engine ?—No, I don't.

22,724. (*Chairman.*) Your estimate relates to a most important question and we will leave it to you to make up, and perhaps you would also in furnishing the Commissioners with the correct cost of an engine for merely drawing men add what would be the additional expense for drawing men and material ?—Yes ; at one pit I have a cage which is used merely for drawing the men, and the cage, ropes, and guides cost less than 100*l*.

22,725. Have you any safety catches to your cage ?—At one colliery that I am connected with we have. We have Ayton's safety catch, but I don't like it very well myself.

22,726. Why ?—I am always afraid of it catching. I am always afraid of its exercising its safety propensities when it is not required.

22,727. How could that be if the rope did not break, or it was not detached ?—The machinery of many of the safety catches goes wrong. A very little catch will do it sometimes.

22,728. What would happen if it did ?—The cage would stick and the rope would come on the top of it in the shaft.

22,729. But the heads of the men are protected from the rope ?—Quite so.

22,730. Would not the engine driver discover if the rope became slack ?—He would in a short time.

22,731. Do you think any accident could happen to the men from the rope ?—Oh yes, because the cage might fall away again, if it caught slightly, not actually, this I have known, not in my own experience but by hearsay. It may catch slightly and fall away again with the slack rope.

22,732. Do you think any precaution is necessary for over-winding ?—No ; I would not like to see any contrivance which provided for detaching the cage from the rope, because I think the contrivance might go wrong and detach the cage when it was not required. I think it is a very good thing to have catches underneath, so that if the cage gets too high and the rope is broken by coming in contact with the pulley, the cage might be caught and prevented from going down the pit. Such catches might be put in, and they would not effect the working. The cage would never touch them except when an accident happened. The catch would be put above the level, and I think it would be a very good thing to catch the cage in case of the rope coming in contact with the pulley.

22,733. Will you furnish the Commissioners with a description of how that works ?—Yes ; I think a very simple apparatus might be arranged.

22,734. Can you arrange for the cage stopping at different levels ?—Oh yes, that is frequently done.

22,735. And there is no difficulty ?—Oh no, we do it with great accuracy.

22,736. (*Mr. Holland.*) You have seen copper mines ?—Yes ; I have been in a copper mine.

22,737. Are you of opinion that ladders are safer or more dangerous than cages ?—I think they are more dangerous. There is no doubt about it, at least as regards the one I was in.

22,738. Why was it more dangerous ?—I think there is greater danger of the men falling off the ladders ; and also, in the mine I was in we passed very near the pumping spears continually and a very little getting out of the right road might have caused us to be caught by the spears.

22,739. Have you seen a man-engine ?—No.

22,740. You know the man-engine ?—I know the principle perfectly. I have seen drawings of it.

22,741. Could you have any idea of substituting a man-engine for a cage ?—No ; I don't think our men would go down in a man-engine.

22,742. Do you recollect the depth of the Monkwearmouth mine ?—Three hundred fathoms.

22,743. But the shaft is not so deep, I think, is it ?—There is one shaft that depth.

22,744. Do you know at what rate the men are put down that, per hour or half hour ?—I do not.

22,745. (*Sir Philip Egerton.*) Is your mine ventilated by furnaces ?—Entirely.

22,746. How many have you ?—We have two.

22,747. What is the consumption of coal for 24 hours ?—For the two, about 12 tons.

22,748. Can you give the Commissioners any idea of the area ventilated by the consumption of these 12 tons of coal ?—Nine hundred acres of seam ; one-third of which consists of passages or galleries, and two-thirds pillars of coal.

22,749. What is the depth of your down-cast shaft ?—112 fathoms.

22,750. And at what height is the furnace placed in the up-cast shaft ?—The furnace is on the level of the seam.

22,751. What is the depth from the surface ?—100 fathoms in the up-cast.

22,752. It is not so deep as the down-cast ?—Not quite so deep ; that is owing to a fault in the mine.

22,753. (*Mr. Kendall.*) What do those coals cost you per ton ?—They cost us nothing ; because they are refuse coal. We should be obliged to bring them out of the mine whether we wanted them or not.

22,754. But suppose you were to buy them ?—They are not worth more than a shilling a ton, supposing we were to buy them.

22,755. How many firemen attend to these furnaces in the twenty-four hours ?—Four men. There are two for each fire in the 24 hours.

22,756. What do they get a month ?—3*l*. each.

22,757. They are an inferior class of men ?—Any ordinary men will do.

22,758. The refuse go there ?—Yes, old men generally.

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22,759. You have been in a Cornish mine you say ?—I have.

22,760. Have you had any conversation with Cornish men about the use of the skip ?—A great deal ; at least I mean in one visit.

22,761. Did you explain to them the facility with which you can move here in comparison with their slow movements ?—Yes, I explained the quantity of coal we drew and the quantity of men we brought up and sent down, and also that accidents were very rare.

22,762. Did they seem anxious to have it ?—No, they seemed to have a dread of it, a great dread ; they preferred the ladder.

22,763. Except in Cornish mines you have never descended by ladders ?—No ; they are not used in coal mines except for short intermediate staples from one seam to another.

22,764. You don't like staples, and you don't like ladders ?—I don't object to ladders for a short distance, such as 10 fathoms or so. For 10 fathoms I would of course just as soon have ladders as anything else, for 60 feet is not a great distance for a man to go up.

22,765. But the moment you get beyond 10 fathoms you think you ought to have a skip ?—Yes.

22,766. (*Mr. Davey.*) You told us yesterday that you preferred a round rope to a flat one ; can you give us a reason for that ?—Because I think the round form is the strongest.

22,767. And you are aware that the flat rope is several ropes sewed together backwards and forwards ?—I have cut up old ropes, and I find that by the sewing the wire ropes are constantly injured; some of the wires are half worn through in a very short time.

22,768. Are the wires not bored through to get through the sewing material ?—No, not in the manufacture. I don't think they are ever broken in the manufacture ; but there is always work for one wire more than another when the rope is at work, because in going over the pulley the top part has more pressure than the bottom part, and of course the wires wear there very much.

22,769. What will be the difference in the expense of a corresponding round rope and a flat rope ?—Round rope is cheapest.

22,770. Would it give you notice of any probable accident as soon as a flat rope ?—Sooner, I think, because you cannot in a flat rope see the derangement caused by the sewing.

22,771. (*Sir Philip Egerton.*) Fewer of the constituent wires are exposed to friction in a round rope ?—Yes, there is not so much friction on a round rope because the wires are all lying in the same rake; but in a flat rope they have manufactured several constituent ropes and then sewed them together.

22,772. What are they sewed with ?—Wire.

22,773. Is there the same heat in this refuse coal that you use as in the good coal for shipment ?—No ; there is not so much.

22,774. So that you use more of the refuse than you would of the best coal ?—Yes.

22,775. Can you give any idea to what extent ?—I should think about one-third more, roughly speaking.

22,776. Therefore, if you use 12 tons of this refuse coal, 8 tons of ship coal would do the same work ?—Yes, 8 or 9 tons.

22,777. I want to know also do you consider it would be more expensive, and would require a greater consumption of coal to ventilate a colliery than to ventilate a metal mine of the same size, of the same area, and with the same depth of shaft, and the same power ?—I don't think there would be much difference.

22,778. You don't think that on account of the foul air there would be much difference ?—I don't think you would feel it ; but there is a point on which there would be a difference. The spaces at which the drifts are driven in metal mines are much greater than with us. If you drive a single passage you must have some artificial way of getting the air up, either by a pipe or by dividing the passage by means of a wooden partition or brattice into two parts. Of course with us these divisions are very short. We only carry them 30 yards one way and about 20 yards the other. I believe that in most metal mines the distance the divisions are carried is very much greater than that.

22,779. (*Mr. Kendall.*) You have not been very much in metal mines ?—No.

22,780. You have only been once in a Cornish mine ?—Only once.

22,781. You hardly feel competent to give an opinion as to the relative difficulty in ventilating the two ?—I should have no hesitation in undertaking to ventilate a Cornish mine ; it is only a matter of cost.

22,782. But as to the relative difficulties ?—Perhaps I should give a very decided opinion.

22,783. (*Mr. Davey.*) Do you think you could apply furnaces to the Cornish mines ?—Oh yes.

22,784. (*Mr. Holland.*) I think you have the management of a colliery where there is a ventilating fan ?—No, I have not the management, but I have visited it.

22,785. At what mine is the ventilating fan used ?—It is at Elsecar. Mr. Atkinson, the inspector, has made a very careful series of experiments on that fan.

Mr. MATTHIAS DUNN, Government Inspector of Mines, Newcastle-upon-Tyne, called in and examined.

Mr. M. Dunn.

22,786. (*Chairman.*) How long have you been an inspector ?—Since 1850.

22,787. What were you before that ?—A colliery viewer.

22,788. For how many years have you had knowledge of the working of coal mines ?—I went to serve my apprenticeship in 1804, so that I have been 40 years up to the time of my appointment as inspector.

22,789. And always in this district ?—Always in this district.

22,790. Have you been employed in Scotland and other parts ?—Both in Scotland and Ireland I have been employed.

22,791. How many collieries have you now under your inspection ?—I think very nearly 200. The number is constantly varying.

22,792. How many men should you say are employed in them ?—I don't have any record about the number of men, but it will be about 30,000 at any rate.

22,793. What are the means of access, of ascent and descent, and of access generally speaking, in this district ?—The access is all by the cage, with one exception in Northumberland.

22,794. What is that ?—It is at Shilbottle colliery where they still use baskets. Shilbottle colliery is in the northern part of the county.

22,795. The men come up in baskets ?—Yes ; either in baskets or chains.

22,796. Do they come up more than one at a time ?—Oh yes.

22,797. How many ?—Sometimes six, sometimes seven. I may mention that I have urged them very much to introduce cages and tubs. Two deaths have recently occurred in this shaft, one strangled amongst the chains attached to the basket, the other from a coal falling off the basket down the shaft.

22,798. Will you describe the basket ?—The basket, made of wicker work with an iron bow across, carrying 6 or 7 cwt. of coals, contains perhaps three men or four men ; and the other day when I was there, there were some upon each other's knees and hanging upon the chain too, and upon the rope above also.

22,799. In your experience, about how long is it since the cages were introduced, or perhaps I would say is it within your experience since the cages were first introduced ?—Yes.

22,800. What was the mode of ascent and descent before that ?—Such as I have mentioned ; either in

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chains or by hanging upon the rope, or in tubs and baskets.

22,801. Were there any means of ascent by ladders?—No, none in this country.

22,802. Were the cages always of the same construction as at present?—Pretty nearly. They differed in proportion to the extent of the colliery, in the size of the tub, and so on. But they are mostly constructed of timber, although lately of iron. The framework is of timber, and the cage sliding up and down in that framework of timber or iron, and lately guides have been applied of round wire ropes, in some cases a species of railway attached to the framework of the brattice.

22,803. What are the guide-rods composed of generally?—The guide-rods are not otherwise than that, except in certain cases where there is a wire rope guide.

22,804. But are the guide-rods of wood or iron?—Generally speaking, of wood, excepting in hot shafts. In hot shafts they are now introducing wire rope.

22,805. As guides?—Yes, as guides.

22,806. Are there any rails used?—I think there is one colliery that uses rails up the brattice side and fastened to the brattice, and the side of cage is in connexion with them for a guide.

22,807. Are any cages used which have a safety break in case of accident?—There are very few in this county. I was present when Fourdrinier introduced his safety cage at Usworth colliery; but it was hardly approved of at the time. Since that, Whits and Grant have introduced a safety cage, and it is very generally used in Scotland, and has been known on several occasions to save the cage from running amain. In fact it is uniform in Scotland, but somehow or other, I don't know how it is, it has never been largely introduced in this country.

22.808. You don't know any reason why it is not used here?—Well, I suppose one reason is, that there is a fear of accidents happening in the shafts. But especially as the ropes are kept so strong and good, and the great weight of cage would be difficult to check in case of breakage.

22,809. And as to the breakage of the ropes?—There is scarcely ever heard tell of such a thing. As soon as a rope begins to show signs of failure it is taken off invariably in this country.

22,810. Are there any accidents come under your notice occasionally by men going up and down in cages?—Very seldom; sometimes they occur. They are enumerated in our reports—the inspectors' reports—every year. The head of shaft accidents includes the fall of scaffolds and other casualties, as well as cage accidents.

22,811 But you think they are very rare?—They are very rare.

22,812. Are any of them from the breaking of the ropes?—My three reports are here, and I believe there is one mentioned in them, but they are very rare indeed. Great care is taken of the ropes and the ropes and shafts are all excellent and good.

22,813. Are the ropes generally flat or round?—Both are used.

22,814. In your opinion which is the best?—I think the round rope seems to prevail more now than the flat. It is more convenient for winding round angles, and would in new countries be generally more applicable.

22,815. Have you ever seen any mines in which access has been by ladders?—No, not in this country, I have seen them in Belgium.

22,816. At great depths?—Oh yes. I have seen some 180 fathoms. That was in 1848, and I suppose that now they are a great deal done away with in Belgium.

22,817. Should you consider ladders a safer mode than cages?—Perfectly objectionable.

22,818. (*Mr. Holland.*) Would you go down ladders yourself?—I was invited to go down the ladders in Belgium, but I declined it. I went down in the cuffat. There was a Government law to oblige people to go up and down the ladders. It arose from the great number of accidents that happened in the shafts. They are mostly of bricks and those bricks were thrown out of position by the tubs and neglected and it was difficult to keep the shafts in repair, owing to their smallness in diameter and the sides being lined with ordinary bricks.

22,819. (*Chairman.*) Would there be any difficulty in applying the cage to a shaft with a considerable under-lie?—I think if it came to a very considerable under-lie it would come to a railway up the slope and upon that railway would be placed the tub.

22,820. Do you think that by means of guide-rods you could apply a skip to all shafts?—Mostly I should think.

22,821. Suppose you had a shaft varying considerably?—That might perhaps require to be made straight. It would require some alteration perhaps to make it suitable to the application.

22,822. (*Mr. Kendall.*) It would require alteration to make it of uniform inclination?—Yes, but it would depend upon the particular circumstances of the slope.

22,823. (*Chairman.*) Have you ever been down any metal mines?—Yes, I have been down lead mines.

22,824. In what district?—In the Cumberland district and in Scotland.

22,825. In your opinion could the cage be adopted in those mines that you have seen?—I should think they could generally, with very few exceptions; and if the underlie came to a certain angle then I think the railway would be applicable rather than the cage ordinary guides. I think on a slope even it would probably be better done by railway guides, and then it would not require to be so perfectly uniform.

22,826. You think if the rails were laid as guide rods?—Guide rods would be required to be perpendicular very much, but if the overlie was so considerable then if a railway was laid up the vein and carried suitably it would be a good mode.

22,827. (*Mr. Kendall.*) Do you say that guide rods are only available for perpendicular shafts?—They will be mostly available for perpendicular shafts. Of course to apply guide rods the shaft should be perpendicular.

22,828. (*Chairman.*) Then would you apply rails instead of guide rods?—Yes; but rails are the exception.

22,829. In your opinion are cages, as adopted in this country, a safe mode of ascent and descent?—Oh yes; if they are properly put in and properly attended to I consider them quite safe. We have very few accidents with the cages excepting in the case of some unforeseen event.

22,830. When there is an accident with the cage how does that happen generally?—Well, it is always explained in the reports why it has happened.

22,831. How about ventilation, is it your special business to look to the proper ventilation of mines?—Yes.

22,832. What is the mode generally adopted?—The mode generally adopted is by means of the furnace, as the chief operator.

22,833. Do you consider that the same amount of ventilation is required for metal mines, considering those metal mines you have seen, as is required for coal mines?—No, very much less.

22,834. Why?—Because for one thing there is no inflammable gas in metal mines, nor are the workings so extensive; although the drift may be extensive the aggregate working places are not.

22,835. But would there be more difficulty in ventilating these metal mines that you have seen, than in ventilating coal mines?—Well, I apprehend that the difficulty in Cornish mines is very much owing to what your lordship mentioned before, viz., the expense of intercommunication.

22,836. But wait a-bit; you have not seen the Cornish mines; you had better not speak as to them. I am asking as to the metal mines you have seen in

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Cumberland ?—Well they don't need so much ventilation.

22,837. Why ?—Because they are not so extensive and because the shafts are more frequent.

22,838. (*Mr. Holland.*) There is less gas to remove ?—Yes, and there is no inflammable gas generally. I might mention that there is one case of artificial ventilation in the neighbourhood of Newcastle.

22,839. (*Chairman.*) Is there any colliery under your inspection having a system of ventilation worked by the steam jet ?—None, except where there is the necessary escape from the boilers in the act of working made use of. Notwithstanding the evidence before Mr. Hutchin's committee, the steam jet has never once been re-enacted.

22,840. Do you know of any instance where the ventilation is by a fan worked by the engine ?—Yes, I was going to mention that it was a little distance from Newcastle. It is a very minor fan producing three or four thousand feet of air per minute.

22,841. Is it drawn out or thrown into the pit ?—At one time the air was pushed in now it is drawn out as being a preferable plan.

22,842. Is that by the engine ?—By an engine. I is a fan about four feet in diameter.

22,843. Do you know any case where air-pumps have been used ?—Not in this part of the country.

22,844. (*Mr. Holland.*) I see from your report that twelve lives have been lost in three years, or four a year, by ropes breaking in collieries under your inspection ; one was in Medomsley shaft ?—Yes.

22,845. Could all these accidents have been prevented by fair care, do you think ?—Yes ; the accident at Medomsley was a case where the rope got off the roll ; consequently the rope went down with a great collision and snapped.

22,846. If a safety catch had been used in this case would not these lives have been saved ?—They would, if the safety apparatus could be made to work well ; the objection is its liability to get out of order ; it does get out of order sometimes, and the difficulty is in keeping it right.

22,847. I see by your report that during the last three years eight men have been killed while descending or ascending shafts ?—I suppose so, but there would be some particular circumstances belonging to them.

22,848. That makes a total of 12 lives in three years lost by rope breaking while ascending or descending shafts ?—A loss of 12 lives in three years while ascending or descending shafts, but not by rope breaking.

22,849. That is to a working population of 30,000 ?—Yes.

22,850. That is an exceedingly low rate of accident?—Yes.

22,851. Am I right in assuming that these men on an average ride up and down 250 days in the year ?—Yes ; and in connection with the exceedingly low rate of accident you must consider the extreme speed they travel at in these cages.

22,852. Then there are about 500 journeys, that is 250 up and 250 down for 30,000 people ?—Yes.

22,853. Then that makes fifteen millions of journeys per annum ?—Yes.

22,854. And there are four shaft accidents per annum ?—Yes ; the shaft accidents in this country are remarkably small.

22,855. Then, if you are right in your figures, they give nearly four million rides for one death per annum ?—Yes.

22,856. Therefore the risk of riding up and down collieries by means of cages is not much greater than on many railways ?—Oh, the risk is very small in such collieries as these, but perpaps in other parts of the country you will find the ratio greater; the ratio is very different in other parts of the country ; in Staffordshire for instance.

22,857. Have you had any men under your observation in this country who have come up and down ladders considerably ?—Not any. I have been in Belgium myself, but I declined clambering up the ladders.

22,858. Had you the opportunity of observing the effect upon the men who did climb ?—Oh ! I have no doubt that ladders are a very objectionable mode of entering mines ; besides a great drawback on the value of their labour.

22,859. Have you any doubt that the system of running men up and down mines by cages is very superior to ladders ?—I have not the least doubt of that.

22,860. You consider it much safer ?—Oh yes ; much.

22,861. Do you know the man-engine ?—Well, I have heard of it ; I never saw it, though I admire its ingenuity.

22,862. You have seen descriptions of it ?—Oh yes ; I know the nature of it quite well.

22,863. Is there any comparative advantage in the cage over the man-engine ?—The cage is decidedly preferable, and much more economical in application.

22,864. It is almost infinitely superior ?—Infinitely superior.

22,865. You have been told that the managers of the mines in Cornwall have a dread of the danger from the use of cages in their mines ; do you consider that dread of danger by the managers of metal mines in Cornwall a rational dread ?—I consider it perfectly bottomless ; it is a mere prejudice. I was very intimate with a gentleman named Vivian, a manager, who was concerned with one of the Cambrian mines ; I took him down to see the operation of the cages, but still it did not satisfy him. I will put in a drawing of the air pump employed at Hebburn colliery on this river ; it is made of wood, and has double action. (*A sketch is enclosed. See Appendix A.*)

Mr. JOHN JOB ATKINSON, Inspector of Mines for the South Durham District, Bowburn, near Ferry Hill, called in and examined.

Mr. J. J. Atkinson.

22,866. (*Chairman.*) You have heard Mr. Dunn's evidence, is anything in your district different from what he has stated ?—We have a large fan ventilating one of the mines in my district, it is at Tursdale colliery.

22,867. And is that worked by an engine ?—It is worked by an engine distinct from the other engines.

22,868. An engine specially for the purpose ?—Yes.

22,869. And that draws the air out of the mine ?—It does.

22,870. Does it act efficiently in your opinion ?—It acts efficiently for the requirements of that colliery, but it is not a good kind of fan.

22,871. Is the colliery not of great extent ?—It is not of great extent as yet.

22,872. What is the depth ?—The depth is 93 fathoms.

22,873. Have you any idea of the extent of the workings ?—The extent of the workings will probably be between half and three quarters of a mile from the shaft, chiefly in one direction.

22,874. Are there any inflammable gases in them ?—There are occasionally blowers, and there is a little general discharge as well.

22,875. And is the fan able to draw it ?—The fan ventilates that colliery very perfectly indeed.

22,876. What power is the engine that works the fan ?—It is about 30 nominal horse-power.
fan, but I have not the figures with me.

22,877. But you can furnish a correct statement ?—Yes. I have indicated that high as 38 horse-power with the fan making 59 revolutions per minute.

22,878. (*Mr. Holland.*) Perhaps you will state about what it is and correct it afterwards ?—The quantity of air was then 65,358 cubic feet per minute.

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22,879. And the fan is about 24 feet in diameter?—Yes, it is 22½ feet in diameter.

22,880. (*Chairman.*) Is that kept constantly working?—It is kept constantly working night, and day.

22,881. Do you know the amount of the coal used?—96 cwt. in 24 hours, or 7·467 lbs. per minute

22,882. Can you give any idea now?—The above consumption is due to the fan when making about 50 revolutions per minute; its ordinary rate of working.

22,883. Is it a less expensive mode than ventilating by furnaces?—To get the same amount of ventilation by a furnace at this colliery would be less costly. The Tursdale colliery fan is wasteful of power, only utilizing about 24 per cent. of the power applied to the piston of the engine by which it is driven. When making about 50 revolutions per minute, the engine consumes about 7½ lbs. of coals per minute; whereas by furnaces I calculate that an equal amount of ventilation would result from a consumption of about 5¼ lbs. of coal per minute; allowing one-third as loss by cooling, on the average of the depth of the shaft. But with a fan, or any other kind of ventilator, utilizing 40 per cent. of the indicated power, the consumption of coal to produce the same amount of ventilation would only be 1·3525 lbs. per minute, on the assumption that the engine by which it was worked consumed 6 lbs. per indicated horse-power per hour. The engine driving the Tursdale fan consumes, I believe, about 18 lbs. of coal per indicated horse-power per hour; so that it is not a fair case from which to judge of the comparative cost of fans and furnaces.

22,884. Do you think there could be any fan made which would be able to do the same work as a furnace in an extensive colliery?—Most decidedly; and a good fan, I think, is a cheaper mode in a large number of collieries than the furnace. A fan used by the Pneumatic Despatch Company strikes me as being one of the most likely fans for being a successful one in the ventilation of mines.

22,885. Which is that?—Rammell's. It gives an efficiency of 44½ per cent. in one of the experiments we made with it; that is to say, 44½ per cent. of the power applied to the piston driving the fan was utilized in the production of ventilation; which is a high efficiency for a fan; it is not many fans that give so much.

22,886. When you furnish the answer, perhaps you can give full particulars as to what cost, in your opinion, it can be worked at?—With a fan utilizing 44½ per cent. of the indicated power of the engine by which it is driven, as was done by that of the Pneumatic Despatch Co. in one of the experiments made by my colleague Mr. Dickinson and myself, and with an engine consuming only 6 lbs of coal per indicated horse-power per hour, the consumption of coal would only be about 13½lbs. per utilized horse-power per hour But by furnace action in a shaft 100 fathoms deep, allowing one third of the temperature added to the air by the furnace to be lost by cooling, on the average of the depth of the shaft, the consumption of coal would be 55·3 lbs per utilized horse-power per hour, being a saving of 55·3—13·5 =41·8 lbs. of coal per hour, for each utilized horse-power employed, in favour of fan action compared with the use of furnaces. Where the shafts are deep and dry, furnace action operates more advantageously than under the opposite conditions. The above saving of coal is equal to 163 tons per year on each horse-power effective in the production of ventilation, so that for 10 horse-power it would amount to 1,630 tons per year, and so on, for any greater ventilating power employed. To set against the saving in coals due to the use of such a fan and engine in lieu of a furnace, would be the extra cost of establishing, upholding, and working the engine and fan, over that required for furnaces; the cost of attendance would probably be about the same in each case.

22,887. (*Mr. Holland.*) Do you remember the degree of exhaustion the pneumatic fan produced?—The pneumatic fan will produce as much as 6 or 7 inches.

22,888. I am told it has lately gone as high as 12?—It has gone as high as 12 or 14 when the valves were closed, but when open 6¾ is as much as I have seen

22,889. What exhaustion does it produce?—Only about 6¾ inches when making 179 revolutions per minute with the valves open.

22,890. Could you produce more by closing down the shaft?—Yes; but there would be a danger of breaking the fan if you drove it much quicker.

22,891. What percentage of the power does the Tursdale fan get?—About 24 per cent. is utilized for ventilation; but in this particular case at the Tursdale Colliery there is only about four-fifths of the used in ventilating underground; the remainder being wasted by the leakage of the brattice in the shaft.

22,892. That is 26 per cent. of the indicated power of the engine in the drift?—Yes.

22,893. Is it worked as well as it will work?—Yes, I think so.

22,894. At the price of coal in Durham, it is not much different in cost from the furnace, but rather dearer?—Utilizing so small a proportion of the power, it consumes more coals than would be required by furnaces to get the same amount of ventilation.

22,895. But if the cost of coal were as it is in Cornwall 17*s.* or 18*s.* a ton, there would be no question that it is the cheapest?—A good fan would no no doubt be cheaper than furnaces under such conditions.

22,896. Is the fan itself a very costly machine?—This fan, with the engines to drive it and the boilers, it strikes me, would cost about 760*l.*, including the masonry at the boilers and chimney.

22,897. What would the furnace and its drift-ways and all the rest of it at the same sort of colliery cost about?—I should think about 150*l.* to 200*l.*

22,898. The fan would cost about two or three times as much?—Three or four times as much.

22,899. Do you fully concur with Mr. Dunn in the statement that travelling up and down the shaft with properly managed cages is very safe?—I believe it is very safe. I believe that during the eight years that I have been inspector of the South Durham district there has been only one accident causing death by the breakage of a rope, in the shaft of a mine.

22,900. In the last three years you have had one rope broken, and you have had seven accidents in ascending and descending?—Probably so. There has been one rope broken during the present year, and two lives were unfortunately sacrificed by it

22,901. (*Mr. Kendall.*) What is the cost of the engine that works the fan?—The engine and fan with the brickwork about the fan costs 375*l.*, exclusive of setting the boiler. I don't know whether I might volunteer a statement. You have inquired about fans, but there are other ventilators besides fans. There is Mr. Struve's machine very much used in both North and South Wales. It is a very efficient machine if well constructed. I dare say it will give nearly 50 per cent. of the indicated power of the engine. There is an other machine, by Mr. Nixon.

22,902. Will you explain Struve's machine?—It is an exhausting pump with double acting engine and a pair of cylinders, worked vertically with a water-joint While one is ascending it is drawing the air underneath it from the mine, and expelling the air from above it into the atmosphere. When the same cylinder commences to descend it draws the air from the mine, about it, and expels it from beneath it into the atmosphere, each cylinder working up and down.

22,903. What size is the cylinder?—Some of them will be 16, 18, or 20 feet in diameter.

22,904. They have been very generally adopted in Wales, I think?—There is a good number of them.

THOMAS G. HURST, Viewer, Backworth Colliery Newcastle-upon-Tyne, called in and examined.

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22,905. (*Chairman.*) You have heard the evidence; is there any point on which you differ?—I think not; I quite concur in everything those gentlemen have said. I might state as regards guides in shafts, that I believe rails are becoming more general than they were; I mean iron rails instead of wood. I think that in these large collieries in Northumberland they will become very general. There is a clip that takes hold of them, and I think from what I have seen of them they are much safer than wood.

22,906. (*Mr. Kendall.*) They are adopted in this neighbourhood, are they not?—Yes, not very far from here. They are adopted at Seaton Delaval and North Seaton.

22,907. These you have seen?—Yes.

22,908. And you think they are an improvement on every other plan?—Yes.

22,909. To protect tipping, and so on?—Yes. They are not so liable to spring; the bolts are not so liable to come out.

22,910. Have you any idea of the expense of these rails, and of the ordinary guides?—I cannot speak off-hand, because so much depends on the shaft and the manner you put them in; on the whole the iron is the more expensive process, but it will last as long as the colliery. They are merely the light rails we use underground; they are very light, I should think from 20 lb. to 30 lb. to the yard; they cannot cost very much.

22,911. Do you know of any other mode of ventilation than those we have heard of here?—No. The furnace is universal with us in Northumberland, because it is cheaper and it is less liable to go wrong.

22,912. In all cases you burn refuse coal?—Oh, decidedly, in all cases.

22,913. And you are able to keep up the fires by men who have low wages in consequence of their not being very strong and infirm and so on?—Just so, they are kept up at a very moderate expense.

22,914. I suppose the system is very generally the same in all cases?—Oh yes.

22,915. You have an up-cast and down-cast shaft?—Yes; There are always two shafts, there is no variation in that.

22,916. With respect to the steam jet, you have seen that?—Yes; I was resident viewer at Seaton Delaval under Mr. Foster when it was first applied and I saw the working of it there.

22,917. In fact it was Mr. Foster's own idea?—Yes.

22,918. What do you think of it yourself?—It was very well there because we had underground boilers and waste steam, or at least more steam than we required for the engine, but I think, to produce the same effect, it would be more expensive than the furnace.

22,919. But your impression is that when you had waste steam there it was very well to apply it?—Decidedly.

22,920. But if you had to get it now, you would not begin the steam jet?—I think not.

22,921. (*Mr. Holland.*) About how many men have you under your observation at the mines?—Do you mean the persons who ascend and descend and who are not only coal-hewers?

22,922. I mean who ascend and descend the shafts?—About 1,000.

22,923. And how long have you had the management?—I have had the management of collieries about 17 years.

22,924. And how many fatal accidents in connexion with cages in the shafts have you had in that time?—None.

22,925. Have you had any accident at all?—We have not had the slightest one.

(The sitting was here adjourned.)

NORTHWICH.

Wednesday, February 24th, 1864.

PRESENT:

The Right Hon. Lord KINNAIRD, M.P.
Sir PHILIP DE MALPAS GREY EGERTON, Bart., M.P.
NICHOLAS KENDALL, Esq., M.P.
RICHARD DAVY, Esq., M.P.
JOHN ST. AUBYN, Esq., M.P.
The Hon. F. LEVESON GOWER, M.P.
P. H. HOLLAND, Esq.

The Right Hon. Lord KINNAIRD, M.P., in the Chair.

Mr. JOHNSON FLETCHER examined.

Nor

Mr. J

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22,926. (*Chairman.*) You are joint lesses of a salt mine, I believe?—Myself and partner, Mr. Rigby, are lessees of the Marston Old Mine.

22,927. How many other mines are being worked at present?—There are six in this district and one at Winsford, about seven miles from here.

22,928. Are there any shut up, not working now that have been worked?—Oh yes, many.

22,929. Which is the largest, at present working, of the different mines?—The largest in excavation is ours.

22,930. Which employed the largest number of men?—Mr. Hayes's.

22,931. How many do you employ?

(*Mr. Rigby.*) Ten men and boys underground.

22,932. Is that a fewer number than you have employed formerly?—We have employed double and treble the number.

22,933. How many tons of salt are you raising annually?

(*Mr. Fletcher.*) About 10,000.

22.934. Are these several mines in the same stratum of salt?—Yes, they are pretty nearly level; the bed lies nearly horizontal.

22,935. How deep are your workings at present?—112 yards.

22,936. Is there any stratum above that?—Yes.

22,937. Is that working now?—No; it has not been worked for the last 50 years.

22,938. What power do you use for drawing up the salt?—Steam power; about 12 horse.

22,939. Do the men go down by the same machinery as you draw up the salt?—Yes.

22,940. What is the form of it?—We have an ordinary steam engine.

22,941. I meant the bucket or whatever you call it?—It is the bucket they draw the salt in that the men come up by.

22,942. And is that drawn by a rope?—By a flat hempen rope.

22,943. Has wire rope ever been used?—It has never been used, I believe, in the district. There is

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some sort of a notion that the salt might corrode the wire.

22,944. There was an accident caused by a rope breaking a short time ago, was there not ?—There was.

22,945. Can you describe how that happened ? Was it at your place ?—It was at our place. The men used a rope which they had been prohibited from using ; it was a rope quite independent of the ropes in ordinary use for drawing salt ; but the engineer had himself occasion to go down, and very imprudently got his wife to lower him and two other men, by this same rope. They were lowered by their own weight. The brake, or lever, which acts upon the drum, checks them from going too fast. They were going rather swiftly, I suppose, and by applying the brake rather suddenly, caused a jerk, which caused the rope to snap.

22,946. The men were near the bottom, were they ? —They were near the bottom.

(*Mr. Rigby.*) About six yards.

22,947. Were they injured at all ?

(*Mr. Fletcher.*) Not permanently, they are at work now.

22,948. That is not the ordinary way in which the rope is used, is it ?—No, it is quite an extraordinary thing.

22,949. How many hours do the men work ?—Eight hours is an ordinary working day.

22,950. What time do they go down ?—They go down at seven in the morning, and come up at three in the afternoon.

22,951. I suppose there is only one set of men ; none work at night ?—No, there is no necessity for it. Of course if there comes a push, if a ship wants loading quickly, they sometimes work an hour or two beyond the eight hours. But that is a very rare case.

22,952. What are your arrangements with the men for getting out the salt ?—We have men whom we call drift-masters, one or more, and we employ them to get the salt by the ton. They employ other men.

22,953. They are contractors then ?—Yes.

22,954. Are they paid when the salt is delivered at the surface, or how ?—The custom varies. At some pits they are paid for all the work that they do underground. As soon as they have attached the salt to the rope their contract ceases. In other cases they put it into the boats ; in our case we contract with them to raise the salt and put it into the boats. Of course we pay the engineer and keep up the machinery.

22,955. I suppose there is a large open space underground. Can you describe the workings shortly. I want to see whether you drive by levels or leave pillars ?—We go right and left, and all round, and leave pillars 10 yards square, at every 25 yards.

22,956. Do you use timber at all ?—Oh no.

22,957. I suppose from the quantity of salt you take out you can afford to leave these pillars ?—A few years ago the notion was entertained that the stratum of salt was so strong that it would support itself without pillars ; and in some few pits these pillars were taken out, but the consequence was that the strata separated, and the pits were ruined.

22,958. Have you more than one shaft to go down ? —We have two direct shafts.

22,959. (*Mr. Kendall.*) How many men go down at a time ?—Six ; or seven sometimes.

22,960. Have you any limited number at all ?—Oh no.

22,961. There is no inspector to see how many go down, and how many come up ?—No, sir.

22,962. Now, in regard to the drift-masters—do they pay the man or send up the account, and you pay the men under them ?—We pay the drift-masters, and they pay the men.

22,963. Then the men look entirely to the drift-masters for their pay. They contract with you to raise the salt at so much per ton, and then the man look to them for payment entirely ?—Yes, but we exercise a sort of surveillance over the drift-masters, to see that the men are paid.

22,964. Suppose you find the drift-masters are not paying the men regularly, have you power to withhold the money due to the men from the drift-masters ?—I never knew such an instance arise.

22,965. Do you find, if you are particular in making the pillars ten yards square, that there is any falling away of the ground above ?—Never.

22,966. It was only when the experiment was made of removing the pillars, that such accidents occurred ? —Yes.

22,967. How is ventilation carried on ?—Simply by means of the shafts ; we have no artificial ventilation.

22,968. Have you two shafts to every salt works ? —Yes, I think there are two to every salt works in this neighbourhood.

22,969. Is ventilation always good ?—It is always good except when a new pit is sunk, until the communication is made between the two shafts.

22,970. Then in the meantime how do you keep up the ventilation—by artificial means ?—Yes, by artificial means.

22,971. What artificial means do you employ ?—A sort of bellows. But this can be only for a very few weeks, while they are cutting a communication between the two shafts.

22,972. What distance apart are your shafts generally ?

(*Mr. Fletcher.*) They vary. Our's, is I suppose—

(*Mr. Rigby.*) About one hundred yards.

(*Mr. Fletcher.*) Hardly so much, I think.

22,973. Whilst you are making the communication you don't think of raising salt—you drive for the sake of ventilation ?—Yes.

22,974. How wide do you make your communication ?—Perhaps about four or five feet in width, and about five feet high.

22,975. In ordinary times, how much ground can they expend in a day ?—A yard a day is reckoned a good day's work ; but, I should say, that only applies to when they are sinking a new pit, which is a very rare occurrence now-a-days.

22,976. Before the shafts communicate, do you find a simple bellows sufficient for artificial ventilation? —Quite sufficient.

22,977. Through what sort of pipes is air conveyed to the sinking ?—Tin pipes.

22,978. The ground is so easy you don't blast much ; don't use much powder ?—Oh yes, we do.

22,979. How much powder do you use in a month in your mine ?

(*Mr. Rigby.*) We use about a couple of tons a year.

(*Mr. Fletcher.*) Yes.

22,980. Does the smoke last long after ?—No ; it is cleared away directly.

22,981. You can go to work almost immediately, can you ?—Yes, a minute after. The works are never suspended at all from blasting.

22,982. Do your miners live to a good old age ?—Yes, I think so ; fully the average.

22,983. Do they live to be as old as agriculturists in the neighbourhood ?—Yes, I think they live longer ; they are less exposed to the inclemency of the weather.

22,984. What are their wages, as regards the wages of other workmen ?—The wages of an efficient salt miner are 3s. 6*d*. a day.

22,985. How many classes of men have you got working underground ?—The drift-master, an efficient workman, an old man who is perhaps not able to earn so much as a stronger one, and a boy.

22,986. At what age do they become old in your mines ?—We don't see any difference between them and agriculturists.

22,987. Do they live better than the agricultural labourer ?—They live well. They are noted for having good appetites.

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22,988. Does their occupation make them thirsty ?—I am not aware that it does. They take a little coffee, or something of that sort down with them.

22,989. Are they sober men, as a body ?—Yes, and intelligent men.

22,990. More intelligent than agriculturists ?—Yes, I think so, decidedly.

22,991. (*Mr. St. Aubyn.*) The method of lowering by buckets is universal in this district, I suppose ?—It is.

22,992. Have you any officers to see that the apparatus is in proper order ?—It is the duty of the agent or principal to see to that, and for the engineer to report if he hears any complaints.

22,993. Then there was a failure of duty on the part of some one when that accident took place ?—A failure on the part of the man who was forbidden to use the rope.

22,994. Will you describe the width of the rope you use ?—We call them four or six strand ropes. Ours are six strand ; that is, six ropes stitched together. They are five or six inches wide.

22,995. How long will they last on the average ?—It just depends on the work that we have for them. Sometimes we don't raise much.

22,996. How long has your mine been working ?—Nearly a century.

22,997. How long have you been connected with it ?—As manager or lessee, or in some way, upwards of 30 years.

22,998. Do you remember any accident besides the one you mention ?—I don't remember any in our pit except the one that unfortunately occurred a few months ago.

22,999. You use gunpowder ?—Yes ; about two tons a year.

23,000. Have you any accidents arising from that cause ?—Never in my pit, to my recollection. From my own knowledge, I don't remember anybody being hurt from blasting in the mines that I have been connected with for the last 30 years.

23,001. Is there any cause of accident to which the miners in your pits are particularly liable ?—I am not aware of any.

23,002. (*Sir Philip Egerton.*) I think you said that you contract with the drift-men for getting salt ?—Yes.

23,003. Who takes care that the drift-men work the salt in the proper mine ?—It is my business.

23,004. The ventilation now is by shafts, is it ?—Yes.

23,005. Do you find any alteration in the currents in various stages of the weather ?—Many years ago I made experiments for Professor Phillips as to the temperature of the mine, both in the depth of winter and the middle of summer, and I did not perceive any variation a few yards away from the shaft. There was a uniform temperature of 51 degrees summer and winter.

23,006. Do you perceive any change in the current of the air in different states of the weather ?—None whatever.

23,007. Then one shaft is up cast, and the other down cast ?—It goes up one shaft and down the other.

23,008. What lights do the men use in the mine ?—Common tallow candles.

23,009. Do they provide their own candles ?—The drift-master provides them.

23,010. Does he pay for them ?—He finds the men with light, independently of the wages they get ; and gunpowder.

23,011. And there is no deduction from their wages for light or gunpowder ?—None whatever.

23,012. (*Mr. Darey.*) What kind of fuze do you use in blasting ?—A common straw fuze.

23,013. Do you ever try the patent safety fuze ?—I tried it a few years ago, as an experiment, but the men did not seem to like it.

23,014. What was their objection to it ?—I don't exactly remember what their objection was. They had got used to straw, and did not seem to like anything else. The straw seemed, on the whole, so safe that there could not be much improvement.

23,015. What kind of straw do you use ?—Common wheat straw. As soon as they have got the hole ready for charging, they have what they call a pricker, a very small wire, which they introduce into the powder. Then they take the dust which they have chiselled out of the hole, throw it into the hole and ram it down, (leaving the pricker in.) Then they very carefully draw the pricker out, and introduce the straw.

23,016. What is that pricker made of ?—Iron.

23,017. Is the salt water a good material for tamping with ?—Very excellent.

23,018. Then you don't miss blasting very often ?—Very seldom indeed.

23,019. Do you raise any other kind of salt excepting rock salt ?—No. We have springs in the neighbourhood.

23,020. In your mine ?—Oh no ; we have nothing but rock salt.

23,021. What is the value of that at the pit's mouth ?—About 2*s.* 6*d.* per ton at present ; but we have sold it at 8*s.*

23,022. What royalty do you pay ?—4*d.* a ton ; 4*d.* on the long ton, or ton of 2,600 pounds.

23,023. (*Hon. F. Leveson Gower.*) Upon the material drawn up, you say you pay a royalty ?—Yes ; but that is not the universal custom. Under some leases they have a fixed rent, and pay no royalty.

23,024. What quantity of the raw material will make a ton of salt ?—I cannot tell. There is none used for refining in this neighbourhood now. It is all exported in its crude state. There is a little used at Garston, near Liverpool ; but it is so expensive to use it for refining purposes that it has been abandoned for a good many years.

23,025. (*Mr. Holland.*) Do the men work in these pits all their lives ?—Yes. They never take to anything else.

23,026. Do others come ?—Occasionally ; but to be skilled workmen they should begin early in life.

23,027. Are there some men working in the pits only occasionally ?—Sometimes men who are employed on the surface go down, but merely to fill the buckets.

23,028. Is there any difference in state of health between those who work constantly and those who work occasionally in the mines ?—I am not aware of any. The miners are decidedly more healthy than those who are subjected to the heat of the pans.

23,029. Is there any idea of working in salt mines being considered unhealthy ?—No, it is considered a most healthy occupation ; and I may say that our pit is the only one where we can have horses down to bring the salt from the workings. The horses are uncommonly healthy ; they get quite sleek and fat.

23,030. Do the men who work in the mine also work in the sinking of the shaft ?—Yes.

23,031. Are these two employments equally healthy ?—No, I think the sinking is not a healthy occupation ; not so healthy as the other.

23,032. What is the cause of the difference ?—In sinking the shaft they have to work sometimes up to the knees in water.

23,033. Is the air bad sometimes in sinking ?—They are supplied with air artificially by means of bellows.

23,034. Have you any difficulty in keeping the lights in, in sinking ?—If the air is bed the lights burn dimly.

23,035. But is it sometimes so bad as to make the keeping of the lights in difficult ?—I think not. They sometimes have to incline the lamp a little.

23,036. (*Sir Philip Egerton.*) It is very rarely you have sinking to do ?—Very rarely ; and we are not likely, I think, to have any more. Two thirds of the pits are closed altogether now.

23,037. (*Mr. Davy.*) Have you sunk to the bottom of your salt ?—There is salt below us for yards, but we have reached the best part of the seam.

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23,038. (*Mr. Holland.*) Is the driving always in rock salt?—Yes; it averages from 25 to 30 feet in depth, all salt rock.

23,039. (*Hon. F. Leveson Gower.*) Do you use tramways?—Yes.

23,040. Do they corrode?—No.

23,041. At what age do the miners begin working?—Not so young now as they formerly did. They now begin at 12 or 13.

23,042. They used to begin earlier, did they?—Yes, I understand so.

23,043. (*Mr. Kendall.*) What is the occupation of the boys underground?—Chiselling the holes.

23,044. (*Mr. St. Aubyn.*) You say the men who work underground are more healthy than those who work at the pans; in what way does the difference show itself?—They are not exposed to such violent changes of temperature. There is a uniform temperature below.

23,045. Are you aware that there is any difference in the duration of life?—I should say the miner would outlive the salt boiler.

23,046. (*Mr. Kendall.*) Which has the highest wages, the panman or the boiler?—Some boilers get heavy wages. In mines payment is by the ton.

23,047. What classes of men have you got; are they all the same?—We have the boilers—those who make the refined table salt; and we have what we call "wallers,"—those who make the coarse salt.

23,048. What is the difference in their earnings on an average, is it appreciable?—Yes, the men who make the fine salt get higher wages. They have more laborious work than the common salt men.

23,049. What is the average of the highest class of wages?—We have men at the boiling pans, who, with the assistance of a lad or a man's wife, can get two pounds a week.

23,050. Did I gather just now that you provided the men underground with powder?—The drift-man supplies the men, independently of his wages, with powder and candles. He has to find the candles out of the rate per ton we pay him. He goes into the market and gets them where he likes; powder also.

23,051. (*Mr. Davey.*) How do you pay the men?—The rule is so much per ton, according to the quantity they have raised per week.

23,052. Do you pay them in gold, or notes, or how?—In silver and gold, for their convenience in paying their men.

23,053. Then you don't use any notes?—Oh no, nothing of the sort.

23,054. (*Chairman.*) What is the area of your mine?—20 to 23 statute acres.

23,055. And how much is taken up by the pillars?—About one sixteenth of the gross extent.

Mr. T Moreton.

Mr. THOMAS MORETON, Surgeon, Northwich.

23,056. (*Chairman.*) You are a medical practitioner?—I am.

23,057. How long have you been in practice?—About four years.

23,058. Have you had under your charge, at any time, any men working in the salt mines?—Yes, very often. I have a large practice here in connection with the Dispensary; and I can form a pretty good opinion of the cases from that source,—not exactly a statistical one, because I have never had time to prepare it.

23,059. Are they principally men working underground or working at the pans?—Well, both. That will include the rock miners and the salt boilers.

23,060. Is there any difference in the state of health between the two?—There probably is a little.

23,061. Which do you think has the advantage in the way of health?—I think there is very little difference.

23,062. Are they liable to any particular disease?—I have thought the matter over pretty carefully, and have come to the conclusion that it is neuralgia or rheumatism, or the different forms of that disease, to which they are most liable. It may be called neuralgic rheumatism or rheumatic neuralgia.

23,063. And do you see this affecting not one class only?—I think those who work underground are more affected with rheumatic neuralgia, or that class of disease, than the upperground men.

23,064. Are the upperground men any more liable to colds?—Yes, they are, certainly; but it is no doubt owing to their own indiscretion. They suffer probably more from chest affections.

23,065. Are they exposed to great variations of temperature?—Oh, yes, very great, very great indeed.

23,066. Are the pans in covered houses?—Part are and part are not.

23,067. Is the heat very great?—Very great.

23,068. Have you had any cases of accident brought under your notice?—I have had several.

23,069. From the men working underground? I'll take them first?—Yes. There was an accident last year, in the pit you are going down to-day, caused by the breaking of a rope. Three men fell

fractured limbs?—In one case,
ad fractured legs; that was not
wo other cases which I saw, one
bout the head.

23,071. Has he died?—No; he is now at his work.

23,072. Have there been any accidents from any other pits?—Not except scalding.

23,073. That has occurred at the surface?—Yes.

23,074. But underground, have there been any?—Sometimes the men get injured, I believe, in blasting, but no such accident has occurred in my time.

23,075. (*Hon. F. Leveson Gower.*) To what do you attribute rheumatism?—To cold. These men work in their shirts, almost without anything at all on, underground and aboveground too. They will come sometimes to the surface, which is very much colder than at the bottom of the pit, without their clothes on. It is their own indiscretion, undoubtedly.

23,076. Are they sober men?—They are a very sober and healthy class of men altogether.

23,077. Do they suffer as much as farm labourers?—They do not, I believe, as a body. I think their health is as good as any class of labourers that we have.

23,078. Do they suffer most in winter or summer?—In winter, I believe.

23,079. (*Sir Philip Egerton.*) Have you formed any opinion as to the quality of the air in the salt mines?—I have not.

23,080. You never analysed it?—No.

23,081. (*Mr. Holland.*) Do you ever feel the air at all unpleasant?—Yes, it is rather close, particularly in the neighbourhood of the blasting, where a great deal of gunpowder is used.

23,082. Do you think the salt miners are more liable to rheumatic affections than other workmen in the neighbourhood?—Yes, I think so; but I have simply thought this matter over since I received notice the other day. I should do much better if I had 12 months to collect information.

23,083. Do you feel sure they are not more liable to chest affections than other men?—Well, they may be subject a little more to catarrh, the men who work at the pans, arising from change of temperature.

23,084. Are they exposed to very much steam as well as heat?—Yes, you cannot see a man a yard off.

23,085. (*Chairman.*) Do they always pay you for accidents?—Always.

23,086. But not for sickness?—No, they don't. I think the owner of the pit would have the power of calling in who he liked in cases of accident. It has always been the case as far as I am concerned.

Mr. JOHN PIMLOTT, of the Marston Hall Rock Mines, examined.

NORTHWICH.

Mr. J. Pimlott.

24 Feb. 1864.

23,087. (*Chairman.*) Of what mine are you the manager?—The Marston Hall Rock Mines.

23,088. How long have you been employed there? —12 years.

23,089. How many men are employed in the mine at present underground?—58 men and boys.

23,090. Is that more or less than you have had before?—It is about the average. We sometimes have a few more and sometimes less.

23,091. How many tons of salt by the year do you turn out?—About 30,000.

23,092. How do the men go down to their work? —They descend in buckets.

23,093. And how many go down in a bucket at once?— Sometimes there will go down three and sometimes four.

23,094. Is that the outside that the bucket will hold?—It will hold more; but we do not allow more, excepting a boy sometimes.

23,095. Are they lowered by means of a rope?— Yes.

23,096. And steam engine?—Yes.

23,097. Does the same bucket bring up the salt? —Yes.

23,098. How is the salt brought up, loose or in bags?—It is filled into the buckets, and the buckets are brought up.

23,099. How many hours do the men work?— Eight hours, that is, the men who work by the day. Those that are by the piece work sometimes four, sometimes five, sometimes ten.

23,100. How is the work let?—We let it off to four under me.

23,101. What are they called? — We call them drift-men.

23,102. And they employ the men?—They employ the men.

23,103. And pay them?—Yes.

23,104. What wages do they allow them?—If a man is a qualified rock-getter who can do what we consider a day's work, we pay him 3*s.* 6*d.* a pay, and so, from 2*s.* 6*d.* to 3*s.* 6*d.*

23,105. What do you mean by qualified?—Well, there are some men who can do more work than others. There are very few who, if they do not go into the mine when boys, are capable of making qualified rock-getters; taking all the branches.

23,106. By that do you mean experience in blasting?—Yes; a man that we call a qualified rock-getter will do as much work again as others will.

23,107. How much would you say a man could take out in a day?—That would depend upon what part of the work he is working. In some parts not more than a ton and a half in a day; and in others, what we call "under-work" he will get 10 tons in a day.

23,108. Is that owing to the softness of the material, or the position he is working?—It is the position he is working. In some positions, when blasting, he will not bring away many hundred-weights, whilst in others he will remove four or five tons.

23,109. What quantity of powder should you say you use in the course of twelve months?—About 10 tons.

23,110. Have you any accidents from the use of powder?—We have never had but one since we commenced, and that was but a slight thing, a mere nothing, and through carelessness.

23,111. Any accidents from lowering the men down?—Not one, since the commencement.

23,112. How long is it since the commencement of the mine?—We commenced sinking in 1851, but it was in 1852 when we commenced lifting the rock.

23,113. Have you been employed since the commencement?—Yes.

23,114. Have you many boys working?—Seven.

23,115. At what age do they begin to work?—At 12 or 13 years of age.

23,116. And what should you say is the age of the oldest man who is working?—About 65 is the oldest that we have now. We have one that has retired from work that is in his eighty-fourth year.

23,117. Have these men been working with you from the commencement, many of them?—Most of them.

23,118. How many shafts have you?—Two for the Rock mine. We have another for the water that is collected.

23,119. What is that water?—From every shaft there is a little surface water; and we have a shaft sunk on purpose to collect it from round the other shafts to prevent its going down the mine.

23,120. How is that got rid of?—It is pumped up by a steam engine.

23,121. What is the depth of your mine?—315 feet.

23,122. When you opened the mine, did you sink both those shafts?—Yes.

23,123. In sinking those shafts, had you any difficulty in regard to the air?—Not at all. While they are sinking the shafts there is air conveyed down.

23,124. How?—By a pair of large bellows.

23,125. How are they worked?—They are a large pair of blacksmith's bellows, and worked by a boy.

23,126. How is the air taken down to where the men are working?—By tin pipes.

23,127. Of what thickness?—About two and a half inches.

23,128. Did you ever see any effect on the candles whilst sinking a shaft?—Not at all.

23,129. Are the shafts not furnished with brattice work or anything?—No.

23,130. The men working on the bottom, how were they lowered? — They were lowered by a bucket.

23,131. A bucket worked by hand?—Yes, while the men were down sinking the shaft.

23,132. What extent have you opened up underground, should you say?—About 12 acres.

23,133. What is the temperature in the mines?— I have not ascertained. I could not speak confidently. It is much the same both winter and summer. It will feel much warmer now than the atmosphere is on the surface; and much colder in the summer.

23,134. (*Mr. Kendall.*) I suppose your system of working and system of pay is just the same through the mines here?—Yes.

23,135. In your mines, have you got two beds or seams of rock salt; what do you call them?—Seams. We only work one.

23,136. What is the workable depth; the depth you work at profitably?—14 feet upon the average.

23,137. Have you ever worked in seams less than that?—No.

23,138. Have you in any other mine?—Not that I am aware of.

23,139. Are the pillars the same size in your mine as in others?—They are larger, I think.

23,140. What are yours?—We are leaving them now 10 yards by 12.

23,141. You have had no falling away, have you? —No.

23,142. Then why leave them larger now than you did some time ago?—In some of the mines formerly there has been falling in by taking the pillars away.

23,143. You talked of "qualified men" just now; there is no sort of apprenticeship in your mine, is there, amongst the miners?—No, Sir; no apprenticeship.

23,144. What you mean is really thoroughly able-bodied men, skilful men, having been young and well trained up; that is what you call "qualified men"? —Yes.

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23,145. Do you class them at all in the mine; are they written down as "qualified men," or is it only the common usage of saying?—It is only the common usage of saying.

23,146. (*Hon. F. Leveson Gower.*) What clothes do the men work in?—They usually have nothing on but drawers, and stockings and shoes.

23,147. Where do they leave their clothes?—On the top, in the engine or boiler house.

23,148. It is left to them which they like to do?—Yes.

23,149. Do they come up very hot from the mine?—No, sir.

23,150. Have they far to walk to their homes generally?—Some of them three miles; some a mile; some half a mile. The furthest is about three miles and a half.

23,151. (*Sir Philip Egerton.*) Do your drift-men deliver the salt in the flats or in the mine?—In the mine.

23,152. And you pay them so much a ton?—So much a ton to deliver it in the buckets at the mouth of the mine.

23,153. What royalty do you pay in your mine?—We have no royalty at present, but an annual rent.

23,154. (*Mr. Kendall.*) Is it a minimum rent; or, suppose you raised 30,000 tons or 60,000, would your rent be the same?—The same.

23,155. Have you a lease?—Yes, for 60 years, at a fixed rental but limited acreage.

23,156. (*Mr. St. Aubyn.*) Then if you extend your acreage your rent increases?—We cave on a royalty.

23,157. (*Mr. Davy.*) Supposing the mine was exhausted at the level you have stated, would it be worth sinking for afterwards?—It would not; it would be inferior.

23,158. Are your workmen generally sober men?—I could not say that. Some of them are, and some not.

23,159. Are they at all prudent with their money; if they get their 8*s.* 6*d.* a day, do they spend it all eating and drinking, or lay by any?—I am afraid there are not many who lay by any.

23,160. (*Hon. F. Leveson Gower.*) Are they more sober than agriculturists?—Well, it is much the same, I should say. Some are sober and some are not.

23,161. (*Sir Philip Egerton.*) Have you ever had a case of men striking for wages?—One.

23,162. Under what circumstances?—They struck for 4*s.* a day, but went in again at the same price.

23,163. How long ago is that?—Five years ago last August.

23,164. How long did they remain out?—About 14 days.

23,165. (*Mr. Holland.*) You said you had 58 men and boys underground?—Yes.

23,166. Are any of them ill?—No.

23,167. All in pretty fair health?—They are.

23,168. Is there a disposition to coughs or spitting among the miners?—I think not. I don't think there are any men more healthy than the rock salt miners.

23,169. Have you noticed that they are more liable than other men to rheumatism?—Well, we have not any men who are subject to that.

23,170. (*Mr. Kendall.*) How many drift-men have you in your mine?—Four.

23,171. What kind of men are they; qualified men originally, or not?—They were.

23,172. Then the best of the qualified men, who get above their fellows, become drift-men?—Generally the post of drift-men is given to the men who sink the shaft; they have the privilege of being drift-men, or the privilege of getting the rock when they get to the bottom.

23,173. I suppose you are able to make your calculations at the end of each month or two; what do they generally get, as an average, the drift-men?—Not more than 25*s.* or 26*s.* per week.

23,174. Then they are not so well off as some of your experienced salt boilers?—Well, if a man gets more he has some to pay off.

THOMAS SOUTHERN examined.

T. Southern.

23,175. (*Chairman.*) Where do you work?—I work at Mr. Hayes's mine.

23,176. How long have you worked there?—I helped to sink it down 12 or 13 years ago.

23,177. Had you been a salt getter before that?—Yes, I have been a salt getter 40 years.

23,178. Working in other mines in this district?—Yes.

23,179. (*Mr. Holland.*) How old are you?—54.

23,180. (*Chairman.*) Are you a drift-man?—Yes.

23,181. How many men do you employ?—From 50 to 60 men and boys.

23,182. But I meant how many under you?—They are all under me.

23,183. Do you take the whole?—There are four partners have the pit to ourselves.

23,184. When you were sinking the shaft, had you any difficulty about the air?—No.

23,185. Did you not find it close at all?—Well, it is rather close when you are agate of sinking to what you may expect it will be when you get to the bottom.

23,186. Did you find any effect on the candles burning?—Yes.

23,187. How were the candles affected?—They will not give such a light when you are agate of sinking till you get to the bottom.

23,188. How did you make them better?—We blowed the air down.

23,189. When you got that did you ever suffer om it at all?—No.

23,190. Felt no effects?—No.

[illegible]. How many had you working in the sink- [illegible] at once, six hours at once, night and [illegible]

[illegible] ne down at a time?—One down at a [illegible]

23,193. What was the size of the sinking?—About four feet.

23,194. Is it one of those shafts now that you go down?—Yes.

23,195. Four feet square?—Yes.

23,196. Do you never find the air close below when you are working?—No.

23,197. How far are the two shafts off each other?—10 yards.

23,198. You sunk first one shaft then the other?—Yes.

23,199. Then did you drive straight through from one to the other?—Yes.

23,200. What width did you go?—About four yards.

23,201. While you were driving those four yards from one to the other, was not the air rather close?—Yes, till we got through; when we got through the air was as pure as it is here.

23,202. Was it by means of bellows that you got air down before you got through?—Yes.

23,203. (*Mr. Holland.*) Did you keep the pipe of the bellows to the face of the drift till you got down?—Yes; then the air was as pure as it is here.

23,204. (*Mr. Kendall.*) How much, in sinking the shaft, can you sink in 24 hours on an average?—A quarter of a yard in six hours.

23,205. Just so. Then you get a yard in 24 hours?—Yes.

23,206. And did you sink by the fathom or by the day?—By the fathom.

23,207. What did you get generally?—30*s.* a yard. Then we found men to wind the stuff from us out of it.

23,208. When you got down, I understand that you, as one who had sunk the shaft, had the privilege of becoming a drift-man?—Yes.

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23,209. Then I suppose your labours are pretty nearly over; because when you become a drift-man your time is taken up in superintending the other men?—I do not work as hard as they do, but I do work.

23,210. You don't work much, I suppose; your time is principally taken up explaining to them how they are to work?—Yes.

23,211. You put your hand here and there as occasion may require?—Yes.

23,212. (*Hon. F. Leveson Gower.*) How long were you in sinking the shafts?—We were about 12 months in completing them.

23,213. Is that all the sinking work you have had?—No, I have had a great deal of it.

23,214. How many years were you at that work?—(*Chairman.*) He says he has worked forty years.

23,215. (*Hon. F. Leveson Gower.*) But how many mines were you employed in sinking?—I have sunk as much as half a dozen shafts down.

23,216. About twelve months each shaft?—Yes.

23,217. And you never suffered from it?—No.

23,218. (*Chairman.*) Is it a healthy occupation below?—Yes.

23,219. (*Mr. Holland.*) How long was it before you got the drift finished from shaft to shaft?—About two months.

23,220. Had you any difficulty in the air during that driving?—No.

THOMAS BARBER of the Marston Rocksalt Mine. (Messrs. Fletcher and Co.)

T. Barber.

23,221. (*Chairman.*) How old are you?—Turned 65.

23,222. How long have you been working?—About 55 years.

23,223. Have you sunk a shaft there?—No.

23,224. But you are now a drift-man?—Yes, I have been most of the time since I was grown up.

23,225. How many men have you specially under your own charge?—I used to have about 20.

23,226. How many now; have you charge of the whole of the men?—I have not just now, but when I was a drift-man I had. I have not been a drift-man these last two years.

23,227. What are you now?—I am a rock-getter.

23,228. How much can you get out in a day?—Near two tons a man.

23,229. Does that depend upon where you are working?—Well, there are two portions; you cannot take as much out of the top as the bottom. You can take twice the quantity out of that you work under.

23,230. Is it all taken out by blasting?—Yes.

23,231. How are you paid, by the day or by the quantity?—The drift-man takes it at so much a ton; then he employs the men, and they have from 3*s.* 6*d.* to 2*s.* 6*d.*, or so.

23,232. He pays them according to what he is able to work?—Yes.

23,233. (*Mr. Holland.*) Do you consider it a healthy employment?—Yes.

23,234. Is it so considered by your fellow workmen?—Oh yes.

23,235. You never heard to the contrary?—Nothing to the contrary.